THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

VOL. XXII. No. 545.] LONDON, AUGUST 12, 1873. [25TH YEAR.] Price 1s.

RAMSAY'S NEWCASTLE CANNEL COAL. Analysis—10,000 cubic feet of gas per ton of coal; 26-candle gas; 13¼ cwt. coke per ton of coal.

The London Exhibition in 1851 was lighted with gas made from Ramsay's Cannel.

RAMSAY'S PATENT CONDENSED COKE.
DO. GARESFIELD COKE.

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GAS-RETORTS, introduced 1828. FIRE-BRICK WORKS, established 1804. FIRE-CLAY SANITARY PIPES, CHIMNEY-TOPS, and all Goods made of Fire-Clay. The Fire-Clay is worked from Blaydon Main Colliery, is of excellent quality, and no expense spared in perfecting every article. The FIRE-BRICKS (marked "RAMSAY") are to be seen in all parts of the world, and the Works are the most extensive in the Kingdom.

Manufactories—Derwenthaugh, Swalwell, and Hebburn Quay, near Newcastle-on-Tyne; and London Wharves—Falcon Wharf, No. 80, Bankside; and Honduras Wharf, Cubit Town. Large stocks kept.

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Patentees of the Standard Gasometers for the Government, and of the

IMPROVED DRY GAS-METERS.

These Meters are warranted to measure correctly and not to vary. Their acknowledged superiority has brought them into general use more rapidly than any Meters hitherto manufactured.

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236, GEORGE STREET, GLASGOW;
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JOSEPH COWEN and CO.,

BLAYDON BURN, NEAR NEWCASTLE-ON-TYNE,

Were the only parties to whom a PRIZE MEDAL was awarded at the GREAT EXHIBITION of 1851, for "GAS-RETORTS and OTHER OBJECTS in FIRE-CLAY," and they have also been awarded in the INTERNATIONAL EXHIBITION of 1862, the PRIZE MEDAL for "GAS-RETORTS, FIRE-BRICKS, &c., for EXCELLENCE of QUALITY."

J. C. and Co. have been for many years the most extensive Manufacturers of Fire-Clay Retorts in the United Kingdom; and orders for Fire-Clay Retorts of all shapes and dimensions, Fire-Bricks, and every other article in Fire-Clay, are promptly executed at their Works as above.

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Coal Office,
QUAY SIDE, NEWCASTLE-ON-TYNE.

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J. R. and Co. make all kinds of Tubes and Fittings for Gas, Steam, and Water; Gun-Metal Cocks, Stocks, and Dies; Galvanized Tubes and High-Pressure Tubes, &c.

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ESTABLISHED 1830.

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NEAR NEWCASTLE-ON-TYNE.

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CROLL'S DRY GAS-METER,

PRIZE MEDALS.
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(INVENTED & PATENTED IN 1844,)

COMBINING ALL THE LATEST IMPROVEMENTS,

MANUFACTURED ONLY BY

PRIZE MEDALS.
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MEDAL AWARDED, EXHIBITION, 1862, "FOR GOOD WORK."

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GALVANIZED & GLASS ENAMELLED TUBES & FITTINGS,

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Also ORDINARY WELDED WROUGHT-IRON TUBES and FITTINGS,

FOR GAS, STEAM, & WATER, EITHER BLACK, GALVANIZED, OR ENAMELLED.

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For Gas, Steam, Water, &c.

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IMPROVED DRY GAS-METERS, in Cast-Iron or Tin-Plate Cases;

STATION-METERS, ALL SIZES, up to 15 feet Square, with PLANED JOINTS;

Experimental Meters, Photometers, Pressure-Gauges,

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The only Prize Medal awarded for TUBES & FITTINGS.

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ONLY MAKERS OF HOMOGENEOUS METAL TUBES.

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CAST & WROUGHT IRON TANKS FOR DITTO;

PURIFIERS, CONDENSERS, SCRUBBERS, RETORTS, VALVES;

IMPROVED WROUGHT-IRON RETORT-LIDS, CROSS-BARS, & SCREWS;

AND GAS APPARATUS OF EVERY DESCRIPTION.

SOLE MANUFACTURERS OF LIVESEY'S PATENT GASHOLDER MAN-LID,

By use of which Man-lid, inlet and outlet pipes can be examined and cleansed without loss of gas in crown of holder, or ingress of atmospheric air.

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1862.

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CLASS II.

This Paint having been in general use over eleven years (especially in some of the principal Gas-Works), and proved itself the best light-coloured Paint produced for resisting the influence of vitiated atmospheres, it is important that its qualities should be more widely known.

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Reference is kindly permitted by the Engineers of the City of London, Commercial, London, and Surrey Consumers Gas Companies, who pronounce it the best Paint known for their purposes.

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SOLE PROPRIETORS OF

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CALLEY'S GENUINE "TORBAY" PAINT

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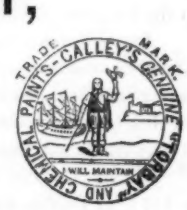
THE ANTI-GALVANIC PAINT.



THESE PAINTS ARE SPECIALLY PREPARED, and are most valuable for protecting and arresting rust on all ironwork, AND WILL COVER TAR EFFECTUALLY; they adhere strongly, acquire great solidity, do not crack, flake off, or blister by heat, and they resist the effects of SULPHUROUS AND GASEOUS EXHALATIONS.

They are used extensively at a large number of GAS-WORKS, on Gasholders, Purifiers, and all classes of Ironwork; also by Government, Railway Companies, &c.

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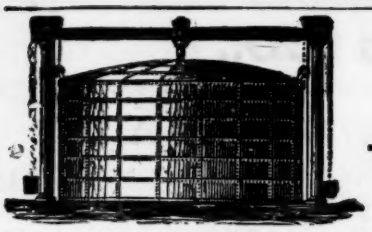

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WHITESTONE IRON-WORKS, HUDDERSFIELD.

SOLE MANUFACTURERS of B. W. THURSTON'S IMPROVED SCRUBBER, CONDENSER, and WASHER, in use in many of the principal Gas-Works on the Continent.

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Wrought-Iron Roofs, Bridges, and Girders; Steam, Hot Water, and Range Boilers; Tanks, Cisterns, &c.,

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ALSO OF

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AND ALL DESCRIPTIONS OF APPARATUS USED IN GAS-WORKS.

PATENTEES AND MANUFACTURERS OF THE

DRY-FACED CENTRE-VALVES,

Which are now so extensively used.

During the last year these Valves have been introduced into some of the large gas-works in London, where they are giving the greatest satisfaction. Favourable reports have been received from the engineers of these and of some of the most important works in the kingdom. The demand for them both for home and foreign works continues unabated.

Every Valve is made with covering bars, to protect ALL the faces. The Patentees found the necessity for this almost immediately after they commenced the manufacture of these Valves, and they have ever since adopted the practice. The large experience they have gained has also enabled them to introduce several minor improvements in the construction of their Valves. It is an advantage peculiar to these Valves that the covers can be easily raised, the faces cleaned and oiled, and kept in perfect condition. If managers of gas-works will periodically attend to this, the Valves will be as good after twenty years use as when first put in.

Messrs. COCKEY AND SONS have been very successful in the erection of many gasholders, some of very large size. They erected, in 1871, at Dublin, for the Alliance Gas Company, one of the largest in the kingdom; telescopic, 182 feet 6 inches diameter. It was referred to by the Chairman of that Company the following year, in his report to the shareholders, as having been in use, and working most effectively, since its erection, and being in the highest degree satisfactory to the Company.

Plans of gas-works are carefully prepared, and every improvement which long practical experience can give is introduced into works entrusted to the care of the Advertisers.

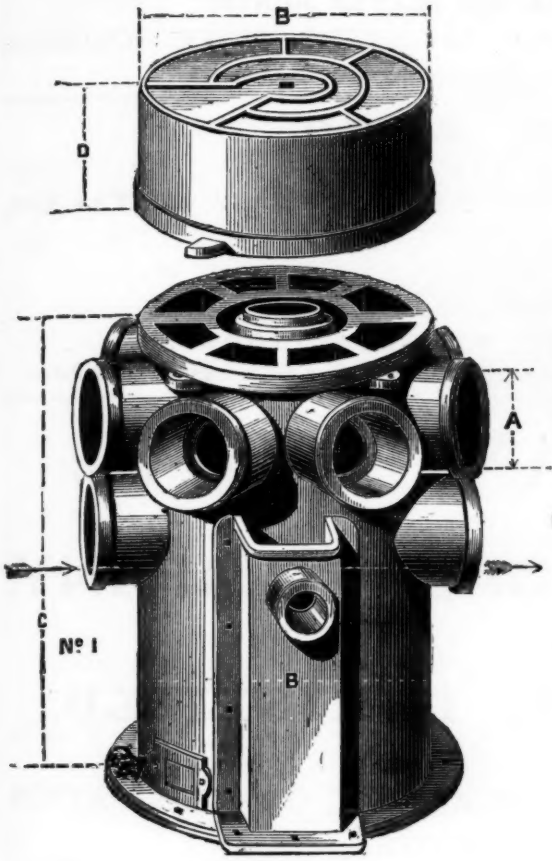
References can be given to the Directors of many Companies who have placed works in their hands, and who will testify to the satisfactory results of so doing.

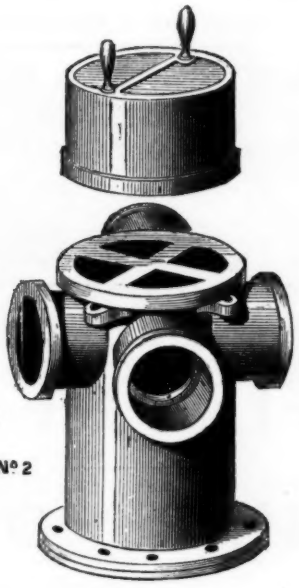
THE THORNCLIFFE IMPROVED CENTRE-VALVE,

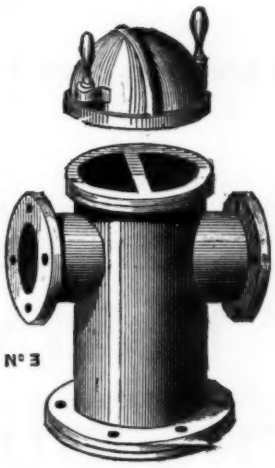
MANUFACTURED BY

MESSRS. NEWTON, CHAMBERS, & CO.,

THORNCLIFFE IRON-WORKS, NEAR SHEFFIELD.







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THORNCLIFFE IMPROVED CENTRE-VALVE.

		Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.
A	Bore of Pipe...	4	5	6	7	8	9	10	12
B	Diam. of Body.	16	20	23	26	28	31	34	40
C	Height of Tank.	33	35	38	43	46	48	51	56
D	Depth of Cover.	8	9	10	11	12	13	14	16
	Total height...	41	44	48	54	58	61	65	72

THORNCLIFFE IMPROVED BYE-PASS VALVE.

SIZES

From 3 ins. upwards.

THORNCLIFFE IMPROVED STOP-VALVE.

SIZES

From 3 ins. upwards.

In all cases the Covers are cast heavy enough to resist any required pressure.

The advantages derived from the adoption of these Valves are so manifest and cardinal that in the immediate character of the change—the simplicity of the machine—the facility affording for cleaning out connexions between Valve and Purifier—the perfect collection and delivery by suitable overflow of the ammonia, at a greatly diminished depth from ground-line over the old form of Valve—the advantage of connecting on the same level, and at any angle, or opposite to each other, the inlet and outlet pipes without dip or rise—the clear acquisition of space in the purifying-house, by being able to place the boxes nearer together, the new Valve being entirely under the floor—and lastly, though of the greatest importance, the passage of crude and unpurified gas during the change is minimized to the merest fraction, thus preventing the fouling by impure gas the delicate machinery and easily affected exposed movements of the station-meter, thereby preventing the introduction of the enemy (unpurified gas) into the gasholder. Also a dead abutment is offered to all back pressure, imparting thereby to the gauges, governors, and hydraulic seals, a steadiness of action never realized with the once famous, but now fast becoming obsolete, Hydraulic Centre-Valve.

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PURIFIERS, CONDENSERS, SCRUBBERS, GASHOLDERS, ROOFS,

And every description of Gas Machinery.

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IMPROVED CONSUMERS WET GAS-METERS

IN CAST-IRON CASES,

THE UNVARYING WATER-LINE GAS-METER,

AND

IMPROVED DRY GAS-METERS;

STATION-METERS OF ALL SIZES, with PLANED JOINTS;

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MANUFACTURERS of FIRE-BRICKS, LUMPS, & TILES,

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THE DUNKIRK COAL COMPANY.

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WEST OF ENGLAND ENGINEERING WORKS, EXETER.

GASHOLDERS AND TANKS,

Retorts, Retort-Fittings, Condensers, Scrubbers, Purifiers, Station-Meters, Governors, Rack and Screw Valves. Gas and Water Mains always in Stock.

STEAM-ENGINES, EXHAUSTERS, SHAFTING AND GEARING, &c.

GAS-FITTINGS,

Including Chandeliers, Pendants, Hall Lamps, Brackets, Star and Sun Lights of all designs.

WET & DRY GAS-METERS,

Combining most recent improvements in principle and manufacture; upwards of 200,000 already in work, giving highest satisfaction.
(A guarantee of five years given with every Meter.)

PLUMBERS WORK, including Lift and Force Pumps; Cocks for Gas and Water and Steam; Brass Fittings.

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MR. W. H. BENNETT, having had considerable experience in matters connected with Gas, Water, and Sanitary Improvement, begs to say that he continues to assist Inventors in the perfection of their designs, and to obtain for them PROVISIONAL PROTECTION, whereby their invention may be secured for Six Months; or LETTERS PATENT, which are granted for Fourteen Years.

Patents completed, or proceeded with at any stage, thereby rendering it unnecessary for persons resident in the country to visit London.

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MANUFACTURER OF

WOOD GRIDS

FOR PURIFIERS AND SCRUBBERS,

AND

CONTRACTOR FOR GAS APPARATUS & MAIN-LAYING.

TANGYE BROTHERS & HOLMAN,

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SOLE MAKERS OF

MORTON'S PATENT SELF-SEALING RETORT-LIDS,

WITH

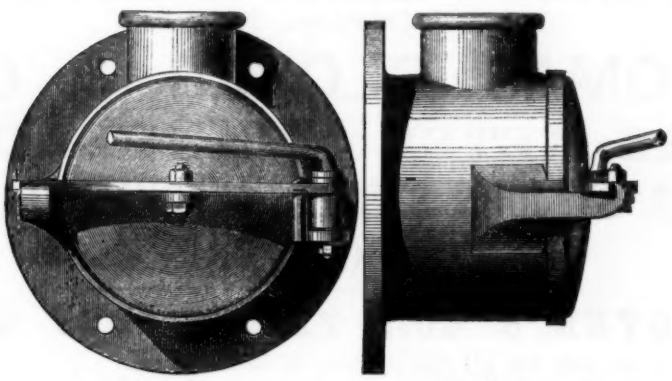
HOLMAN'S PATENT ECCENTRIC FASTENINGS.

OVER 7000 IN USE.

NO LUTING.

LIDS HINGED TO MOUTHPIECES; NO LIFTING ON OR OFF.

NO SCREWS FOR FASTENING.



FRONT VIEW. SIDE VIEW.

SIMPLE.

ECONOMICAL.

DURABLE

EFFECTIVE.

NO DUPLICATE LIDS REQUIRED.

These Lids are proved by many eminent Gas Engineers to be the most efficient, saving much time, labour, and expense; are opened and closed as quickly and with as little trouble as an ordinary furnace door, and by their use the Retorts are soundly sealed during the whole period of carbonization.

THESE LIDS ARE IN USE AT THE FOLLOWING (AMONG MANY OTHER) GAS-WORKS:—

The Gaslight Company, Beckton (where over 2000 are in use).	The Gas-Works, Royal Arsenal, Woolwich.	The Nottingham Gas-Works.
„ Gaslight Company, Bow Common.	„ Alliance and Dublin Gas-Works.	„ Newcastle-on-Tyne Gas-Works.
„ London Gaslight Company.	„ Edinburgh Gas-Works.	„ Carmarthen Gas-Works.
„ Independent Gaslight Company.	„ Manchester Corporation Gas-Works.	„ Merthyr Tydfil Gas-Works.
„ Phœnix Gaslight Company.	„ Salford Corporation Gas-Works.	„ Ystrad Gas-Works.
„ South Metropolitan Gaslight Company.	„ Rochdale Corporation Gas-Works.	„ St. Alban's Gas-Works.
„ West Ham Gas Company.	„ Liverpool United Gas-Works.	„ Over Darwen Gas-Works.
	„ Birkenhead Gas-Works.	„ Aylesbury Gas-Works.

The Morton's Lid is made circular in form, that being the most convenient and suitable shape. It can be used for Retorts of any section, by adapting the Mouthpiece casting from the D, oval, or other shape, at the back, to circular in front.

The following important Testimonial, among others, has been given:—

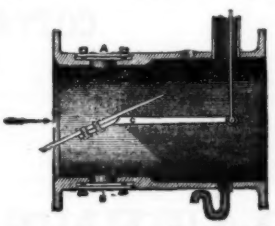
The Gaslight and Coke Company. Engineer's Office, 6, Westminster Chambers, Nov. 14, 1871.

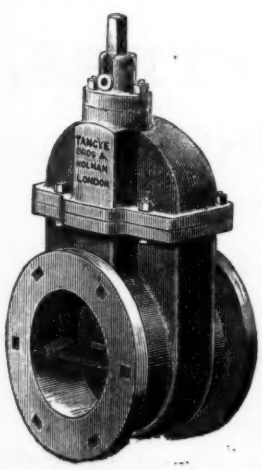
Dear Sir,—In reply to your inquiry, I have the pleasure of stating that the whole of the Mouthpieces at Beckton have Morton's Lids attached to them, and they have given us every satisfaction. We have 2160 in use.—I remain, yours truly, (Signed) F. J. Evans.

SOLE MAKERS OF

HUNT'S PATENT EQUILIBRIUM GAS-GOVERNOR.

In this Governor a Throttle-Valve is substituted for the ordinary suspended Cone, all external communication being avoided by placing the Lever or Radius Arm (shown at C on the drawing) inside the Valve-Chamber, upon the Disc. The Disc is carried upon steel centres, upon which it is accurately balanced and turns freely. The friction in working is thereby reduced to a minimum. This Governor is extremely sensitive to alterations of inlet or outlet pressure, and renders a large actuating holder unnecessary.





London Gas-Works, Nine Elms, Dec. 25, 1871.

Gentlemen,—The 18-inch Hunt's Patent Throttle-Valve Governor supplied by you to this Company has been in use for about six months, working very satisfactorily; it obviates entirely the oscillation which sometimes occurs with the ordinary Governors, with the annoyance and danger arising therefrom. The efficiency of this Instrument, together with its compactness and lowness of price, ought to ensure its general adoption.

Messrs. Tangye Brothers and Holman. (Signed) Robert Morton, *Engineer.*

TANGYE BROTHERS AND HOLMAN

Have in Stock, and ready for immediate delivery, the following GAS-VALVES:—

20 3-inch Rack Valves.	9 6-inch Screw Valves.	13 10-inch Screw Valves.
7 4 „ Screw Valves.	14 8 „ „	12 12 „ „
10 5 „ „	10 9 „ „	14 14 „ „

CLELAND'S PATENT DIRECT STEAM-JET EXHAUSTERS.

TRAVELLERS AND HYDRAULIC LIFTS FOR PURIFIER LIDS, &c.

London 1851. New York, 1853. Paris, 1855. London, 1862.

Dublin, 1865. Paris, 1867.

The SIX MEDALS AWARDED to THOMAS GLOVER for

PATENT DRY GAS-METERS,

The latter being the Highest Medal awarded for Dry Gas-Meters by the Imperial Commissioners for the Universal Exhibition, Paris, 1867.

THOMAS GLOVER & CO.,

DRY GAS-METER MANUFACTURERS,

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1st, Are a remedy for all the defects of Wet Meters;
2nd, Are suitable for all climates, whether hot or cold;
3rd, Incur no loss of Gas by evaporation;
4th, Cannot become fixed by frost, however severe;
5th, Are the most accurate and unvarying measurers of Gas;
6th, Prevent jumping or unexpected extinction of the Lights;
7th, May be fixed either above or below the level of the Lights;
8th, Cannot be tampered with, without visibly damaging the outer case;
9th, Will last much longer than Wet Meters;
10th, Will not cost more than one-half for repair that Wet or Water Meters do;
Are upheld for five years without charge.

WILLIAM PARKINSON & CO.,

(SUCCESSORS TO SAMUEL CROSLEY,)

COTTAGE LANE, CITY ROAD, LONDON, E.C.

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WATER METERS.

W. P. & Co. beg to state that they are now prepared to supply Station-Meters with planed joints.

CONTENTS.

	Page
Notes upon Passing Events:—	
The Legislation of 1873 respecting Joint-Stock Enterprises	713
The Purchase of Railways by the State	713
The French Government and the Harbour Works at Boulogne	713
Meeting of the British Medical Association	714
Locomotives on Public Roads	714
Asphalte Pavements in London	714
The late Lord Wolverton	715
Circular to Gas Companies:—	
The Gas and Water Works Facilities Act (1870) Amendment Act	715
The Dublin and Alliance Gas Company	715
The Patent Gas Company	716
Unaccounted-for Gas Accounted for	716
Review:—	
Cracroft's Investment Tracts	716
Correspondence:—	
Gas and Water Works Facilities Act (1870) Amendment Act	716
Unaccounted-for Gas	717
A Problem	717
Increase of Temperature in a Purifier	717
Some Notes upon Air Gas and Oil Gas in America	717
Parliamentary Intelligence:—	
Progress of Bills in the House of Lords	718
Progress of Bills in the House of Commons	719
Gas and Water Works Facilities Act (1870) Amendment Act	720
Legal Intelligence:—	
Court of Chancery—	
Goad *v.* Harvey	721
Berthoud *v.* Warner	721
Vice-Chancellor's Court—The Attorney General *v.* The Birmingham Corporation	722
Miscellaneous News:—	
Meeting of the Berlin Water-Works Company	722
Metropolis Water Supply	722
Meeting of the Patent Gas Company	723
British Association of Gas Managers	726
Alford Gas Company	728
Death of Mr. John Bugby	728
Death of Mr. George Hallett	728
Malton Gas Company	728
Dumfries Gas-Works	728
Advances in the Price of Gas	728
Water Supply of Jerusalem	728
Moveable Seal for Hydraulic Mains and Self-Acting Hydraulic Safety-Valve	729
Pontefract Public Lighting	729
Lincoln Gas Company	729
Boston Public Lighting	729
Whitby Public Lighting	729
Alliance and Dublin Consumers Gas Company	729
Hull Gas Supply	729
Burslem Public Lighting	729
Sir William Fergusson on an Efficient Water Supply	730
Assessment of the Warrington Gas-Works	731
Wisbech Gas Company	731
Canterbury Gas and Water Company	731
British and Foreign Water and Gas Works Company, Limited	731
Extinguishing Street-Lamps	731
Birmingham Water Supply	731
Glasgow Water Supply	731
Kilmarnock Water Company	731
Leakages in Water-Pipes	731
Death in the Milk Can	731
Register of New Patents:—	
Day, J. J.—High-Pressure Valves	731
Chandler, S., sen., S., jun., and J.—Manufacture of Gas	731
Goldsmith and Dilkes—Cooking by Gas	732
Malam, A.—Manufacture of Illuminating Gas	732
Vaughan, E. P. H.—Generating Gas	732
Macfarlane, J. R.—Furnaces used in the Manufacture of Coal Gas	732
Cobley and Poynter—Obtaining Caustic Baryta	732
Davey, H.—Evacuating Condensers	732
Applications for Letters Patent	732
Grants of Provisional Protection	732
Invention protected for Six Months	732
Notices to Proceed	732
Application for Leave to File a Memorandum of Alteration	732
Notice of Application for Leave to File a Disclaimer	732
Patents which have passed the Great Seal	732
Patents which have become void	732

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THE JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, AUGUST 12, 1873.

Notes upon Passing Events.

THE session has ended without any startling change in the relations of Government to public companies. The new tribunal for the settlement of those matters connected with railways, which had previously been the subject of private Acts and parliamentary struggles, has not yet commenced work. The Act establishing this form of dictatorship and compulsory arbitration, although disliked by every railway company, passed with so little opposition that it became quite plain that the parliamentary influence of the railway interest had been greatly exaggerated. The fact is that the railway, like every other interest in the kingdom, has no power unless backed by public opinion, and that it has never taken any pains to conciliate or to cultivate. The members of the new railway tribunal have been very fairly selected, and it is a question whether the fact of the existence of a tribunal of compulsory arbitration will not tend to allay a good deal of unjust prejudice and unnecessary discontent.

The attempt to ruin gas companies, by compelling them to sell gas at a loss, after being restricted in their profits, failed, as we observed in our last "Notes," in spite of the persistent efforts of the official chairman of the Lords committees. This failure shows that the spirit of fair play still exists in Parliament, if properly evoked.

New schemes have not been numerous this session. In a good many old works of public utility the utmost efforts of the directors are tasked to earn a small dividend, and even to avoid loss, in the face of the constantly-rising rate of wages and cost of materials; so that those of the advocates of universal Government absorption are reminded that it is not every undertaking, like the Post-Office telegraphs, in which the purchase is merely the transfer of a profitable ready-money trade. The scandalous mismanagement that enabled Mr. Scudamore to appropriate for public purposes, without detection, nearly a million of money, would have permitted a like appropriation for private purposes. Bystanders who are not *doctrinaires* cannot help thinking that "a Government working railways for itself," in Mr. Scudamore's phrase, would have a dangerous command of vast balances, with which a bold Chancellor of the Exchequer or an unscrupulous and zealous subordinate might do strange things. Is it under Mr. Lowe or Mr. Ayrton that the frogs who complain of the present boards or "Logs" of railway directors desire to place themselves?

The other day, amidst several congratulatory speeches, including one from a representative of Her Majesty's Customs, the first stone was laid of a new dock, an additional dock, at Great Grimsby—Great Grimsby, which thirty years ago was a miserable fishing village, and now counts its trade in millions, and its Customs dues by tens of thousands. Owing to what? To a railway—the Manchester, Sheffield, and Lincolnshire—which has never paid 2 per cent., and for many years paid no dividend to its shareholders; a private enterprise, which has conferred untold benefits on all the localities—manufacturing, mercantile, and agricultural—it has traversed and united; which has created a twin port to Hull upon the Humber, and has stimulated Hull to double and treble its dock and railway accommodation. In fact, an enterprize which has done what no Government owning railways dare do; for no representative Government is permitted to throw good money after bad, although that may be the only chance of making a failure pay.

The advocates for the purchase of railways by the State can neither point out the department fit to manage undertakings which are at once manufacturing and commercial, wholesale and retail, or say at what date, without the loss of precious extensions—whether in 1843, when the idea was started, or 1853, or 1863—the bargain should have been completed.

If we need a contrast to the *laissez-faire* policy which created the sea shelter services of Holyhead, Southampton, Great Grimsby, and Folkestone as part of railway speculations, we have only to turn to the official correspondence on the long proposed, long delayed improvement of the harbour of Boulogne, where, under paternal government and the influence of the official engineers, educated in a great Polytechnic school to look after public works, the whole service between the stinking sewage-charged port and the railway station has been a disgrace to the French nation and a torture to travellers. The French railway company serving Boulogne and Calais, being a close monopoly, had no inducement to improve either port, both being bitter rivals of each other. If they had wished to do anything, the official engineers are an impediment no one will willingly encounter. At length, however, the accident of a visit of the new Minister of Public Works has given the scheme for making Boulogne a deep-sea harbour a hearing. M. Desseilligny has addressed a letter to the prefect of the Pas de Calais, in which he recites the following abstract of the proposal of the Boulogne Harbour Company, which is in part an English company:—"To make a "harbour south-west of the present port, equal to the requirements "of steamers drawing five mètres of water, and build a lighthouse at "the end of the new pier—the harbour to be connected by a branch "line with the Capecure terminus"—at their own cost and risk, without any subvention or guarantee of interest. They estimate the cost of the works at £300,000, and the annual expenses of working, interest, and sinking-fund at £20,000 a year. In return they require

1. An absolute and perpetual grant of all lands recovered from the sea, and available for docks and warehouses.

2. A 99 years concession of the use of the port, free from all tonnage and quay dues, and from all Government, departmental, or local taxes, either now established or to be afterwards established, but "with leave to the company to levy on all and every ship entering the harbour for trading purposes a toll, the amount of which will be fixed by a schedule to be introduced among the conditions of the concession."

An exemption from all dues and taxes is, however, stipulated on behalf of French war ships, and such merchant ships as may put into the new harbours from stress of weather or casualty, and leave without trading.

The company pledge themselves to remove any silting up which may accrue in consequence of the new works at the mouths of the new and present ports, so as to impair in no manner or way the condition of the present harbour.

As a matter of course, although the new Minister of Public Works is anxious to distinguish his career by a great public monument, he meets the usual obstruction from official professionals to which we, on a smaller scale, have been accustomed at our own Admiralty, War Office, and Woods and Forests. The engineer-in-chief of Boulogne "saw objections," but thought, as the improvement was to cost the public nothing, it was worth consideration. The minister then sought the advice of a commission of *Inspecteurs Généraux des Ponts et Chaussées*—the body that for ten years excluded railways from France, and then tried to throw Mr. Locke's viaduct down. Of course, the commission is as full of objections as an egg is full of meat, and their report bristles with obstructions, direct and indirect, like all professional men who have to show their own utility by finding fault with other people's work.

That commission question the possibility of maintaining a harbour and a fairway, which must be dredged out of a sandy beach which lies open to prevailings winds. They are apprehensive that, if the intended waterways are wide

enough to allow the outflow of those currents and minimize the silt, they will likewise allow the incoming of the waves and rough water.

They are further in doubt whether the new pier, even though it should be entirely built on that open-way plan, might not result in setting larger quantities of sand in motion.

With reference to the means set forth by M. l'Ingénieur-en-Chef Legros as preventive of ultimate siltings up, the commission remarked that if those preventive contrivances are, as they think, adequate, guarantees must be devised by which the *concessionnaires* should be bound to erect those moles, if deemed necessary, and to do all the requisite dredging.

Though urging the above strictures, the commission are of opinion that, considering the unquestionable utility of the proposed object and the substantial character of the undertaking, the demand made to the administration should not be blankly negatived; on the other hand, the administration advise the sending up of the plans to a Nautical Board, whose inquiries should be more particularly directed to investigate the consequences which the proposed works might entail upon the present Boulogne harbour mouth and channel.

The Conseil-Général des Ponts et Chaussées agree with these views, reserving, however, the ultimate grant of a concession or the direct execution of the scheme by Government.

Consequently, another commission of nautical men, not including a civil engineer, is to report on the possible dangers to the fishing-boat port of Boulogne. If they do not report against the scheme, then they will display a courage in facing a novelty not often found in official sailors. Remembering how many years this project has been under discussion, one cannot help coming to the conclusion that, after all, our private bill system works better than any other, unless where a wise dictator settles public works by decrees. The late Mr. Brassey preferred "concessions" to private bills. He was rich, and he retained in his pay agents who commanded the backstairs influence of Courts. All Mr. Brassey had to do was to pay the needful bribes, and the concessions followed, unless some one else outbribed him, or found influence in the charms of some new mistress of a king or minister. This was less troublesome than fighting a battle before parliamentary committees, and not more expensive.

The following is a description of the new harbour, the idea of which may interest, although it cannot console, sea-sick passengers by the present cranky boats:

The new harbour of Messrs. Legros and Liddell will consist of two stone piers running out from the shore at Chatillon to the south-west of the present harbour of Boulogne; the eastern piers, which will be 900 mètres (984 yards) long from the present line of low-water mark, will run in a north-west direction from just beyond the house of M. Huguet, present Mayor of Boulogne, a castellated building, with a tower to the west of Capecure pier, which is familiar to all travellers who use the Boulogne route; the second, or western pier, will start from a point 700 mètres (765 yards) further west, this pier will be 1550 mètres (1694 yards) long, for a distance of 1000 mètres it will run north-west, after that it will gradually assume a course north by west, thus completely sheltering and overlocking the eastern jetty; the space between the two piers for a distance of 350 mètres (383 yards), will be filled up to a level of the piers, and form a space for the construction of warehouses.

The east jetty, for two-thirds of its length, will have a width of 40 mètres, and for the remaining third it will have a width of 80 mètres, with a double line of rails running its entire length. At the end of the east jetty it will have a stone head, or jetty, running crosswise, extending 80 mètres west and 120 mètres east. These horns will form a shelter for the steamers, which may land or embark passengers on either side of this pier, according to the wind, in perfectly calm water.

One thousand mètres along the west jetty, and in a line with the head of the east jetty, a jetty, or horn, 200 mètres long, will run in an easterly direction towards the west horn of the east jetty; the space between these two horns, 100 mètres, will form the entrance to the new harbour, which will have a depth varying from 10 to 29 feet at low water, but which, by dredging, will be increased to not less than 18 feet in its shallowest part.

The head of the west jetty will have a depth of 60 feet around it. The jetties will be of solid stone part of their length, and on open arches the rest of their extent; this construction being much in favour with French engineers, who maintain that by allowing free passage to the currents all silting up by sand is avoided.

This harbour will be capable of receiving the largest and swiftest steamers which can be built, whether on the Bessemer or any other principle; it will also form a harbour of refuge, for want of which several vessels are annually lost on this coast, more especially at low water, when distressed vessels are unable to get into the present small harbours, oftentimes difficult of access even at high water. It will require five years to construct this harbour, but the engineers hope that three years will suffice to advance the works sufficiently for large steamers to commence running.

The British Medical Association, assembled in London, has been combining business and pleasure; enjoying professional intercourse and hospitality in a manner which does infinite credit to the present temper of the times—a temper cultivated by the influence of the press and of railway communication. Not the least important event of the week has been the address of the president, that distinguished man, Sir William Fergusson. Sir William has taken the opportunity of putting his protest and his warning against the sensational sham scientific quackeries of Dr. Frankland and his school—a school who not only find death in the pot, but "in all we eat and drink and "wherewithal we are clothed," unless at every step we pay a fee to one of the modern augurs. Sir William Fergusson particularly directed his attention to water—one of the prime necessaries of civilized life. He calls for plenty of water, an ample constant supply of wholesome water. But he laughs at those preposterous quacks who insist on a degree of purity, the standard of which is only to be found in distilled water. The water of urban, suburban, and village wells must be carefully tested lest it be subject to the most fatal of all contaminations—that of cesspools; rivers and brooks used for drinking purposes must be protected from being made the main carriers of sewers. These are plain obvious sanitary conclusions, but as to the theory that the chemistry of nature is not equal to purifying in any distance, in any period of time, and by any volume of water, some accidental and, as compared with the bulk of water, trifling contamination, Sir William Fergusson laughs at. Why, according to this theory, a man drinking distilled water will have it contaminated before it gets to his stomach if he is also indulging in the common luxury of pork and greens. According to the quack chemical theory, every pond, every well, every brook, every river that has ever since the beginning of the world received the drainings from the *dejecta* of any animal, is poisonous to all eternity. The wonder is, how people lived at all before sanitary doctors were invented. Sir William Fergusson's comic treatment of this serious subject will do good, because he does not in the least undervalue rational precautions. But water for washing and water for cooking do not require microscopical investigation; and water for drinking, where the source is suspicious, may be filtered. As for asking a water drinker to drink boiled water, you may as well attempt a trade in soda water, opened in the morning for afternoon's use.

The select committee of the House of Commons, appointed to inquire into the use of locomotive engines on public roads, have made a report which will bear fruit next session in the relaxation of some very mischievous obstructions to the use of steam. In their report the committee state that

Under the Acts of 1861 and 1865, the use of traction and self-moving engines is becoming daily of greater extent, and the increasing cost of horses and of their maintenance renders the substitution of steam for horse power a subject of great moment. A large proportion of the grain grown in this country is thrashed out by portable machines driven by steam, and probably before long these machines will be removed from place to place by steam. In regard to the use of steam upon ordinary roads, the committee observe that locomotive engines (including steam-rollers) are working by day and, in some cases, both by day and by night, in the streets of London, Liverpool, Glasgow, Leeds, Aberdeen, Rochester, and other large towns, and few complaints have arisen in consequence of their use; and as small engines are now employed in all directions for contractors work, steam fire-engines, &c., passing daily through streets and among horses, and as at most railway stations large locomotives are habitually run within a few feet of horses and carriages, and as few or no accidents are known to result from these practices, it seems reasonable to conclude that horses in towns will not take much notice of the passage of road locomotives. The committee think there is little doubt that in some rural districts the introduction of locomotives upon the roads would be attended with greater inconvenience than in towns; but the evidence is almost unanimous to the effect that this inconvenience soon disappears, although there are, and probably always will be, some few horses which will take fright at an engine, as they will at many other objects. With regard to the effect upon roads and bridges, the committee are of opinion that on ordinary well-made roads little or no damage is caused by an engine or by properly constructed waggons; with waggons built specially for steam traction, and with properly constructed wheels, little or no harm seems to be done upon well-made and wide roads. The committee, however, are of opinion that rules should be laid down requiring a certain width of the tires of wheels (according to the weight on the wheel) of vehicles drawn by or attached to a locomotive engine on any common road or highway, not being a tramway. The committee feel assured that as the economical and other advantages of the use of traction and agricultural engines become more widely known and appreciated, the highway authorities will adapt their roads and bridges for the use of those locomotives. In the meantime they recommend that no owner of a locomotive engine be liable for damage done to a bridge by the passage of his engine, if its weight does not exceed 20 tons, and if no notice has been put up that the bridge is insufficient to carry weights beyond a certain limit (such notice to be subject to appeal on that point), but that the owner of an engine exceeding 20 tons be liable for all injury done by its passage to a public bridge or road; the local authority to have power to prohibit the passage of an engine during certain hours along a road of less width than 20 feet. The committee recommend the discontinuance of the red flag carried before an engine in pursuance of the Act of 1865. They propose that locomotives exceeding six tons in weight, or having separate carriages attached to them be classed as "heavy," and their speed limited to three miles an hour in towns, and four miles in the country; that self-contained locomotive carriages (or engines), not exceeding six tons, making no sound from the blast, and consuming their own smoke, be classed as "light," and be permitted to travel at the ordinary speed of vehicles drawn by horses, and only subject to the same restrictions as such vehicles. With respect to the employment of steam upon tramways (a subject not distinctly referred to the committee), they do not present any recommendation, but they received evidence that the power of control and stoppage is at least equal to that possessed over ordinary tramway cars drawn by horses, while there need not be any noise greater than that produced by the movement of the car. They believe that the noise of the discharge steam or "blast" can be so far diminished as to cause practically no danger or inconvenience; and it should be imperative on the owners of engines classed as light traffic to cause them to be so constructed as to prevent any noise from the blast, but with respect to heavy traffic the committee, having in view the large number of engines not noiseless now employed, do not consider that the abolition of the blast should be compulsory. They make the same distinction between heavy and light traffic with respect to consumption of smoke; light traffic engines, and all engines in towns, to be compelled to consume their own smoke or use smokeless fuel, but the present regulations to be relaxed in the case of locomotive engines classed as heavy traffic and habitually working in the country. Finally, the committee recommend that the regulations relating to road locomotives be consolidated into one Act.

The proprietors of 20,000 horses, employed in draught in the City of London, have protested, in a memorial presented to the Commissioners of Sewers, supported in person by Mr. Church, the manager of the General Omnibus Company, against the extension of the use of asphalte. They proved by returns that asphalte is the cause of a large and increasing number of accidents, and of serious injury in the way of strains of the back sinews and loins of the horses working on it. As long as the asphalte is perfectly dry or perfectly wet, all goes well. Horses become accustomed to the material, and none go more safely than fire-engine horses galloping at full speed. But when a shower or fog partially damps the pavement, every heavy vehicle at a standstill is unable to move, while horses in cabs and omnibuses tumble about in wild confusion. There is no argument required, no theory to be supported; a quarter of an hour at the Mansion House crossing just after a summer shower, sufficient to grease, but not to wet, the pavement, will convince the most incredulous that this grievance is substantial. Two sets of interests are involved, of which the horse owners are the weaker. The shop-keeping interest in crowded thoroughfares will support asphalte pavement to a man. It is cleaner than any other, with less dust and less noise than granite. There may be alleviations of the present miseries of greasy pavements, by the use of sand-bags, and water-taps. Sooner or later steam may take the place of many horses. At present wood is the rival of asphalte, less clean and less easily cleaned than asphalte, not so good to wash, less noisy than asphalte, and in every respect, except durability, superior to granite; in a word, it is a question of cost. Given a system of wood paving, not dearer than

asphalte over a term of years, and asphalte will give way to wood in future extensions.

Lord Wolverton having died a peer, a banker, and very rich, as a matter of course the usual fulsome eulogies are poured over his grave. He was a man of gentlemanly manners and banking abilities; he increased a considerable private fortune, and did much for himself and his connexions. But it is really too absurd to forget that, while chairman of the London and North-Western Railway Company, that undertaking fell into the lowest depths of depression, from which it took years after his retirement to raise. The feeble temporizing policy of Lord Wolverton's board, which neither frankly yielded to the rivalry of the Great Western broad gauge, nor boldly fought it, but tried to win by the shallowest devices, resulted in enormous fortunes for a clique of lawyers, and diminutive dividends for the shareholders. Wolverton, from which Mr. Glyn took his title, was a mistake, out of which the resident locomotive engineer made a very good thing. As a rule it may be assumed that bankers are quite out of place as chairmen of great companies. Their views are narrow, their policy timid, as it ought to be if they are to be safe bankers.

Circular to Gas Companies.

We print to-day, in another column, the Gas and Water Works Facilities Act, 1870, Amendment Act, 1873, and Rules issued by the Board of Trade for carrying the Act into execution. It will be seen by our parliamentary report that the Bill received some rather important additions when in committee in the Commons. The enemies of gas companies mustered strong on the occasion, and, led by Mr. Leeman, succeeded in making an alteration which is virtually an "amendment" of the Municipal Corporations (Borough Funds) Act of last year. It allows the costs of an application for a Provisional Order by a local authority to be paid out of the rates. We do not attach much importance to this, for we doubt whether any local authority in the kingdom would at the present time, or during the operation of this Act, have the audacity to apply for an order to prevent "undue "accumulations of profits by undertakers," or, in other words, to reduce the price of gas; and, strictly construed, the Act will not allow the costs of *opposing* an order to be paid out of public funds. The Municipal Corporations, &c., Bill, it will be remembered, expressly mentioned the costs of "promoting or opposing" any Bill in Parliament; but it seems to us that clause 11 of this Bill limits the application of public funds to the payment of expenses incurred by applying for an order. It is, however, a comparatively trivial matter. The costs in either case will be very small, and it is only the principle involved which gives importance to the question.

The debate in committee, reported in another column, suggests a few observations in reply to speakers not answered in the House. Mr. Leeman's position is so well understood that nothing need be said in reply to him. It may be that he thinks his seat in the House of Commons depends on his persistent opposition to the interests of gas and water companies, or rather to two particular companies. But we must question the accuracy of his statement that "in a large "number of towns in this country" there is no power in the local authorities to have the gas-rates revised. We have not at this moment the York Gas Act before us, but we should be surprised to learn that it was obtained before 1847, when the first Gas-Works Clauses Act was passed. We may take it that there are very few statutory undertakings in the kingdom which have not been in Parliament since that date, and therefore must have the general Act incorporated in their special Act. Now, nothing can be simpler than the machinery provided by the Gas-Works Clauses Act, 1847, for a complete examination of the position of a gas company with a view to a reduction of price in case any "undue accumulation of profits" is proved. Any local authority can set two ratepayers in motion, and on their application a court of quarter sessions may enter upon an investigation of the affairs of a gas company, and make an order for a reduction of price if any excess of profit is discovered.

The member for Kendal (Mr. Whitwell) seems to be in an unexampled state of ignorance. He knows no manufacturing establishment which ever raised the price of the commodity they manufactured when the cost of prime material increased. He is also exceedingly innocent, for he complains that gas companies extend their mains and spread their works instead of reducing the price of gas. We would ask Mr. Whitwell what he would do if a manufacturer, tied down to a limited rate of profit. Would not he—or, perhaps, we ought to say, any sensible manufacturer—expend such surplus as he could appropriate to the purpose in improving his works and extending his connexions? And yet for doing this a gas company is blamed.

But to return to the Act just passed, the provisions of which are sufficiently explicit. During the next eight months—that is, to Feb. 15, 1874—statutory gas companies, after conforming with certain formalities, may make application to the Board of Trade for power to raise their maximum price to such an extent as to enable them to pay a dividend equal to that paid in the two previous years, but under no circumstances to exceed 5 per cent. per annum. An order being procured, it may remain in force for such a time, not exceeding three years, as the Board of Trade may prescribe; for whatever time, however, the order is in force, a company having paid less than 5 per cent. will be bound to their misfortunes. Under such circumstances, it becomes a serious question, the decision of which must be left to each individual company, whether or not it is advisable to make any application under the Act. A company who have paid nothing for the last two years may, perhaps, make application with advantage, for they, with the kind permission of the Board of Trade, may be allowed to make 5 per cent. But such cases we believe to be very few in number, and it may be put to them whether it would not be better to go to Parliament next session for an amended special Act than accept the doubtful boon offered by the measure just passed. The uncertain duration of the next session, however, and the possibility—nay, probability—that all practical legislation will be thrown over to a new Parliament, makes us hesitate to advise, since the profit of one year would be lost if no application were made. But except to companies in desperate straits, to whom half a loaf would be better than no bread, a year's delay would be of little importance, and others might wait for the chance that a new Parliament will take a more equitable view of the rights of gas companies, and exhibit a greater regard for commercial interests. It will be to the lasting discredit of the present Parliament that, while they have guaranteed some rich and powerful London companies their maximum dividend of 10 per cent., they have by this Act practically confiscated one-half the property of shareholders in provincial undertakings. On this point we may quote from a powerful letter addressed to a contemporary by Dr. Phelps, the chairman of the Cambridge Gas Company:—

> The London companies who, in consequence of the high price of coal, find themselves unable to pay their maximum statutory dividends, can, by their Acts of 1868 and 1869, obtain, from the Board of Trade, authority to raise the price of gas, so as to enable them to realize 10 per cent. profit. That is to say, the obtaining of powers by those companies to raise the price of gas leaves, as it ought to do, the statutory limit of their profit as before. Can any reasonable being see cause in the circumstance of the increased cost of production for the alteration of that limit? The price of gas must be raised because it costs the companies more to make it. But can this affect prejudicially and detract from the merit of the manufacture? Thus far of the London companies. But how fares it with us, the provincial companies? When we find ourselves, from the same cause, under precisely the same difficulties, we also are authorized to apply to the Board of Trade for relief. In making this application, however, under the Act just passed, we may expect to have to encounter the very serious expense of local opposition; and if, finally, we obtain permission to raise the price of gas 1d. per 1000 feet above the present maximum price, and avail ourselves of that permission, the statutory limit of our profit is, *ipso facto*, reduced from 10 per cent. to 5 per cent.! Now I beg to be allowed to ask if anything in the way of legislation can be conceived more arbitrary and unjust than this? The statutory limit of profits in the case of the Chartered Company of London, as confirmed by recent legislation, is 10 per cent. on the whole of its capital, as it ought to be. That of the provincial companies, under precisely the same circumstances, is arbitrarily reduced by this Act to 5 per cent. And, lastly, scores of companies who have not committed themselves to the protection (?) of Parliament at all—who are under the merciful care of no special Act, are perfectly free to charge what price they please for their gas, and to earn all the profit which the circumstances of their business may permit. . . .
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> It is absolutely undeniable that Parliament did deliberately pronounce and define by Statute the fair and reasonable limit of profit of gas-making to be 10 per cent. on the capital employed. This attracted the money of private enterprise to the business. And when it was seen by the public that the manufacture was a success, that, in spite of the risk of coal gas being superseded by some other method and material, as well as various other risks, there was a fair chance of this allowed and approved rate of profit being maintained, poor people—small tradesmen and others—freely, and with confidence in the judgment and honour of the Legislature, invested their savings in gas shares at such a price as to yield them, when the maximum dividends were paid by the companies, just 5 per cent. The Government Bill which has now passed into law is a sentence of confiscation of one-half of the property thus invested. These poor people who had a right to look to the law of their country for the safety of their property now find they have been cruelly deluded. The law makers, or a small section of them, the others having forsaken their duty, have, with indecent haste, made a new law which deprives the unhappy proprietors of gas shares of one-half the value of their invested savings. The interest on their money will only be 2½ per cent., and they will find it difficult to sell their property for a price which will yield even that cruelly diminished amount of income—a price less than the half of what they paid for it. . . .
> I do not hesitate to declare openly that these poor people have been robbed—robbed of half their savings—by Act of Parliament. I congratulate them on the blessing of representative Government.

And then the doctor concludes with a warning:

> And whoever you may be who read this, I admonish you to look ahead. You may regard with complacency the spoliation of some limited interest in which you are not concerned, or if concerned, concerned beneficially in obtaining some unjust advantage. Look ahead! If you carelessly or selfishly tolerate such legislation as this, depend upon it your turn will assuredly come. Whether you be peer or plutocrat, in the exposure which I am daring to make of unjust legislation towards the proprietors of gas shares, you are concerned as well as they—*de te narratur*; whether you be poor tradesman or wealthy merchant; whether the object of your most cherished interest be water or steam, or brewing or baking, or what not, be not over sanguine as to your safety, however solemn the engagement of the law may have been for your protection. Whatever be your rank, whatever your claims, whatever your rights, whatever your position, look ahead! Be assured that in any conjectural enumeration of the future victims of unjust legislation in a country where such acts as these are tolerated, you are by no means secure of exemption—*de te narratur*.

The warning is perfectly justified. There are the elements of Communism in the demand to-day that gas and water shall be supplied without profit. The day may—is almost certain to—come when it will be demanded that bread and meat shall be supplied without profit, and it may be as well to "look ahead!"

We are happy to learn that there is a prospect of an amicable understanding being arrived at between the directors of the Dublin and Alliance Gas Company and the opposing committee of shareholders. A meeting has already taken place, and an agreement has been come to which will, we hope, render unnecessary the revolutionary proceedings contemplated by the committee. The shareholders should remember that their recent Act imposed very onerous conditions on the company—conditions which, at the best of times, must have produced some temporary difficulties. These difficulties were not sought for and could not be avoided by the directors, and we cannot regard the present condition of the company as proof of any neglect on their part of the interests of the shareholders. Messrs. Jabez Church and Horatio Brothers have been called in to examine

the condition of the works, and their report will be presented at a meeting on the 18th inst.

The affairs of the Patent Gas Company are going from bad to worse. They are losing over £2000 a year at Barnet, and must continue to do so for another year and a half. But what, we take it, is rendering their case utterly hopeless is the fact that they are supplying miserably poor, and very impure gas at Barnet. This we regard as a very serious matter to the company. It has been abundantly proved at Barnet that rich and pure gas could be manufactured by the Eveleigh process, and so far the report from the Crystal Palace District Company does not at all advance the interests of the Patent Gas Company. The point still left in doubt is whether or not the process is an economical one, and as to this Mr. Watson is silent for the present. His fuel account is lower, and he has some excellent pitch to dispose of; but there is nothing beyond this to indicate a greater commercial success than was obtained by Messrs. Keates and Odling. We can, therefore, only anticipate a speedy collapse of the concern. The American purchaser has not come forward with the second instalment of the £250,000, and the shareholders seem now to fully understand the nature of that transaction. In the meantime, low as is the price, there is no speculation in the shares. Registration fees brought only £90 in the last against £390 in the previous half year. It is due to the chairman to say that he very candidly disclosed the state of the company's affairs, and we commend his speech to the careful perusal of our readers. It is said of one metropolitan gas company that it was "born in sin and shapen in iniquity." What will be said of the Patent Gas Company we shall learn by-and-by.

Among our correspondence will be found a letter from Mr. Good, which well deserves attention. The advantage of a stream of water through the meter is not only that it preserves the water-line, and so prevents over-registration; it has, further, a cooling effect, bringing down the gas to a normal temperature and volume, and in that way also reducing the amount "unaccounted for."

Review.

CRACROFT'S INVESTMENT TRACTS.*

A second edition of this useful work has just been published. It contains an amount of information in a condensed form which cannot fail to be highly appreciated by those for whom it has been specially written. The first part deals with the powers of investment possessed by trustees. It points out the various classes of security in which they are authorized to invest, and provides several forms of modern powers as guides to those who are preparing trust deeds. The second part, or "Appendix," gives an analysis of upwards of one thousand securities, Government, railway, gas, water, and miscellaneous joint-stock undertakings, nearly the whole of which are comprised in the official list of the London Stock Exchange. These various securities have been, with great labour, tabulated, so as to furnish, at a glance, their market values during the last six years. The work cannot fail to be of assistance, not only to trustees but, to all persons seeking investments.

Correspondence.

GAS AND WATER FACILITIES ACT (1870) AMENDMENT ACT.

SIR,—As gas companies generally are much interested in this Act, and it has been the subject of much injurious comment, while the proceedings have been attended with very considerable trouble, I shall feel obliged if you will permit me to make some observations upon it in your next publication.

I must say first that those gentlemen who have so strongly condemned the measure have entirely misunderstood its object. They seem to have expected that those companies who had accepted (or if the term is preferred) submitted to bad terms from Parliament, and were unable to earn 10 per cent. out of those terms, were to have the power, with the sanction of the Board of Trade, to get the terms increased so as to enable them to earn 10 per cent.; but no such object was ever for one moment contemplated.

There is a provision in the Act, that when any company has not divided 5 per cent. per annum for the two last financial years preceding an application for a Provisional Order, and an order is granted, this company shall not during the continuance of such order be allowed to divide any larger dividend than the average of those two preceding years. I pointed out the hardship this would be to some of the small companies who had not been able to earn 5 per cent., and suggested its being altered, but it was said this Act is not intended to meet a case like that. If a company has agreed to terms which do not admit of its earning 10 per cent. in the ordinary way, we cannot give it relief; it must apply to Parliament to have those terms reconsidered. Such a case requires a permanant relief, whereas the powers conferred upon the board by this Act only enable it to grant temporary relief, and that for a very limited period. The board can only entertain cases where the loss has "arisen from any unusual increase in this cost of production of gas."

When the present enormous and unprecedentedly high price of coal first commenced, many companies thought it was merely a spurt, and before long the price would fall back again to something like the figure at which it had started from, and being for a time protected by contracts, they considered it would not be necessary to apply for any special legislation; but the high price having continued much longer than was expected, and the contracts having expired in the meanwhile, some of the companies found that unless they could procure relief in one shape or other, they were likely to lose the whole of their dividend, and a large sum upon their ordinary working expenses as well.

This state of things was represented to the Board of Trade, and the board urged to provide by a public measure some means of giving the companies temporary relief, so as to enable them to tide over the present emergency. This is the whole scope and object of the bill, and it never was intended to go beyond it.

The board at first being doubtful of the reception such a bill would meet with in either House of Parliament, declined to give any promise, but said they would consider it.

In the meanwhile several other companies, who had from the first taken a different view of matters, had applied to Parliament by means of private bills for an increase of price, and these bills had been passed by the House of Commons and sent up to the Lords.

The House of Lords then, at the instance of Lord Redesdale, passed three resolutions. The effect of these being that any company having an increased charge allowed, should not during the continuance of such increased charge be allowed to divide more than 5 per cent. per annum, and that the increased charge should only be allowed for a limited period.

This being in effect an admission of the principle from both Houses, another application was made to the board, when the board, being fortified with these admissions, undertook to introduce a bill for granting, by means of Provisional Orders, the relief required.

The bill, to save time, was introduced in the House of Lords first. When introduced, it was in conformity with the resolutions of that House, which had been passed shortly before; but it went farther, and provided that inasmuch as any company might apply for a Provisional Order to increase existing prices, so any local authority might apply for an order to decrease existing prices.

When the bill was appointed to a committee of the whole House, Lord Redesdale proposed the following amendments:—

1. That no increase of price should be allowed, except to save a company from absolute loss.
2. To strike out the powers to local authorities.
3. To limit the dividend during the continuance of any increased charge to 2 per cent. only instead of 5.

These amendments had to be put separately. No. 1 was taken first, and the division upon that being 9 for and 13 against, the others were not put. The bill thereupon was passed, and sent down to the House of Commons without alteration.

The committee of the association then held a meeting to consider the bill, and passed a resolution to the effect that although they were anxious to assist the smaller companies in getting some relief out of their difficulties, they nevertheless could not assist in any way in passing a measure with such novel and extraordinary powers to local authorities, and that if the promoters would not consent to strike out these powers, the companies would be compelled to oppose the bill at every stage. The following day the companies seeking relief under the Act had a separate meeting, and fully confirmed this resolution.

A member of the House of Commons then, at the instance of the companies, gave notice that on the bill being brought up for consideration in committee he would move certain amendments for striking out the powers to the local authorities.

The bill was before the House seven or eight days, waiting a chance of being called on, without any other notices being given respecting it. It was, therefore, confidently expected that the amendments for which notice had been given by the companies would be carried, but after two or three adjournments a day was fixed for going into committee, and on the morning of that day some other notices appeared. These were in effect to confirm the powers to the local authorities, and authorize them to pay their expenses out of the borough or any other local rates under their control.

The bill came on between two and three in the morning, when there were but a very few members present. Government objected to the last alterations, but on a division they were carried by 22 against 21.

The bill thus became more objectionable to the companies than it had ever been before. The next stage of proceeding was therefore opposed at the instance of the companies, and the promoters informed that, as it was impossible for the companies to consent to the bill in that shape, they intended to do all they possibly could to stop its further progress.

This procured me an interview with the President and parliamentary secretary of the Board of Trade, when I was asked to state specifically what the companies objections really were. I said the companies were willing to admit that when a company applied for a Provisional Order the local authority should have the power to object; and if an order was granted, so long as the increased price authorized by the order was in force, the local authorities, if they considered it was maintained unnecessarily, should have the power to apply for a reconsideration of the order. But the bill proposed that the local authorities should have the power to apply for a revision of existing prices, irrespective of the question whether the company applied in the first instance or not.

If the local authorities were allowed such power, and to pay their expenses out of rates whether they were successful in their application or not, great injustice would be done to the companies without conferring any benefit upon the public. No such power had ever been given before. The City of London Gas Act, which was assumed to be a precedent, applied only to one company, and the local authority of that one company's district, and not to the other companies or the other local authorities of the metropolis. Since that Act was passed similar provisions had been inserted in two other metropolitan gas companies Acts, but they were in each case special, affecting a particular company and the local authority of that company's district only, and not general, as proposed by this bill.

The President, when he had made himself fully acquainted with these views, said that the bill, as it then stood, was a decision of the House, and he could not undertake to ask the House to reverse its decision without first consulting the opponents, but the parliamentary secretary would see the opponents, and endeavour to get the matter settled.

The next day I was informed by the parliamentary secretary that the opponents had consented to the bill being altered to meet the companies views. The alterations were submitted to us, and although they were not worded exactly as we wished, we nevertheless, to save time, consented to them, withdrew our opposition, and allowed the bill to pass in the form it now appears in your columns.

Briefly stated, the provisions of the bill are as follows:—Any company may, within the next six months, apply to the Board of Trade for a Provisional Order to increase its price beyond their statutory maximum.

The Board of Trade may grant such an order for a period not exceeding three years.

The company, while charging the higher price authorized by the order, not to divide more than 5 per cent. per annum.

The local authority to have power to oppose any such application, and if they think it is continued longer than circumstances justify, to have it reconsidered.

I will now say a few words with respect to the principle of the bill.

When any company or person makes application to Parliament for some special powers, the application is referred to a select committee to decide upon what terms and conditions the powers shall be granted. The committee, acting on behalf of the public, are, as a matter of course, desirous of making the best bargain they can. If, however, the terms they propose are unsatisfactory, the parties promoting the application can withdraw it and bring it on again in another session before another committee again and again. There is no obligation to accept the terms offered, but if they are accepted they become statutory obligations, and, good or bad, are binding both upon the promoters and the public until the parties make another application for some additional powers, when the whole matter is open for reconsideration. In practice, however, Parliament never arbitrarily interferes with any privileges it has once granted. It says, at times, "We will give you these additional powers if you will consent to some modification of your existing powers," but if the parties disagree to this they can withdraw the application, and there the matter ends, as Parliament never proceeds with a private bill adversely to the promoters.

Every reader of your JOURNAL must be acquainted with numberless instances of companies undertaking parliamentary obligations to construct public works, such as railways, roads, bridges, piers, harbours, docks, and the like, and, after expending all their capital, being unable to realize any divi-

* "The Trustees Guide: A Synopsis of the Ordinary Powers of Trustees in regard to Investments, with Practical Directions and Tables of Securities." London: Edward Stanford, Charing Cross.

dend whatever; but there is no instance on record, as far as I can ascertain, of any increase of tolls having been allowed to compensate for it.

A moment's reflection must convince every unprejudiced person of the absolute necessity of the conditions of an Act of Parliament being conclusive as to terms upon the matters to which it refers. If the companies were to be allowed to apply to Parliament again and again for an alteration of terms, similar powers would of necessity have to be given to local authorities, and then no public undertaking would ever be safe.

Gas companies and water companies are, as respects their profits, both subject to precisely the same regulations—that is, they are allowed to divide 10 per cent., and to set aside a reserve-fund equal to one-tenth part of their capital; and then they are required to appropriate all further profits to a reduction of price.

The Legislature in framing these regulations undoubtedly intended that the companies should be allowed to charge a price that would enable them to earn a dividend of 10 per cent., but they have left it for the companies to say, subject to the foregoing regulations, what that price shall be. The price then being agreed upon with the companies, and inserted in the Act, it becomes as binding upon the company as any other provision; and it follows, as a matter of course, that the company must make its 10 per cent. out of that price or not at all. It is difficult to understand how any one can contend that under these provisions the Legislature intended to secure the 10 per cent. dividend to the companies and not secure the price to the public, when both are on precisely the same footing.

Ten per cent. with gas companies is almost the rule, but with water companies it is the exception. Water companies are subject to greater casualties than gas companies, and hence their dividends are more uncertain. The supply occasionally fails, new sources have to be found, the water becomes impure, or there is a great drought, and many other casualties from which gas companies are exempt. The water companies have to provide a remedy for all these at a great expense to themselves, and very frequently a heavy sacrifice of dividend, but we do not hear of water companies asking Parliament to increase their rates because they cannot earn 10 per cent.

Lord Redesdale, when he proposed his amendments in the House of Lords, said: "Gas companies are allowed to divide 10 per cent., to set aside a reserve-fund, and make up any dividends short of 10 per cent. at a future time, and if the companies had exercised ordinary care they would have provided themselves with a reserve-fund to meet a case like this. I consider that, under the circumstances, the companies are not entitled to the relief proposed by this bill, unless it be to save them from actual loss."

"If this bill passes it will in effect be a guarantee of 5 per cent. to gas companies, and if that is allowed to gas companies how can it be refused to other companies—water, for instance? Nothing of this sort has ever been done before, and I must protest against its being done now. Companies requiring relief ought to apply to Parliament by means of private bills, when each case can be dealt with separately on its own merits."

It was, however, said on the other hand, that the relief proposed by the bill was intended for some of the smaller companies, who were not able under ordinary circumstances to make 10 per cent. That the expense of an Act of Parliament would be a great burden to them, especially under their present troubles, and the delay in procuring an Act would add greatly to their losses.

Several distinguished peers took part in the discussion, and stated their views shortly, but all concurred in the principle propounded by his lordship, although for the reasons just mentioned they passed the bill.

Again, when the bill was under discussion in the House of Commons, although the discussion was on another point, similar views were expressed. The difficulty with this bill has been not so much whether an increased price should be allowed, so as to earn a dividend of 2 or 5 per cent., but whether it should be allowed at all, except to save the company from absolute loss.

The difficulties in which some of the companies are now placed have been brought upon themselves by the want of a little firmness on their own part.

If, when committees propose unfavourable terms, the companies were to say, "We know our own business and circumstances, and cannot, with justice to our shareholders, undertake to furnish a good and sufficient supply of gas, under all contingencies, upon the terms you propose; if, therefore, you cannot modify them, we must withdraw the bill," they would, I am confident, in the majority of cases, get better terms, and if they could not do so from that committee, they ought to withdraw their bill and try another committee in the next session.

No company is justified in accepting the current rate of the day for a maximum to cover all contingencies. If the companies were in all cases to insist upon having some margin for increase, the margin would, I am quite sure, be conceded to them. It is simply the want of a margin that has caused all this loss and trouble.

The complaints of injustice made by some of the companies in the public prints, because they have not been allowed to increase their statutory prices, so as to realize 10 per cent., are very unreasonable as well as unjust, and the assertion that Parliament, on passing this measure, has altered existing regulations and reduced the prescribed dividend of 10 per cent. to 5 per cent. is equally so. As a matter of fact, it is the companies themselves who, by asking for an increase of price, are seeking to alter existing regulations, and not Parliament. What Parliament contends for is, that the existing regulations ought not to be disturbed at all, but if they are to be disturbed for the benefit of the companies, the companies must to some extent, while that disturbance lasts, be made to suffer for it.

No one disputes the right of the companies to divide 10 per cent. if they can make it, but it must be on certain conditions; and these conditions are, that it is made out of the terms which the companies have agreed to accept. As no one could foresee the present unprecedentedly high price of coal, so no one can tell how long it will continue. In another twelve months the price may have gone back again, and all the difficulties be over. To have allowed a general increase of price beyond the statutory maximum to meet such a contingency as this, would have been very unjust to the public, and I cannot believe that the majority of the companies themselves would have desired it. Some temporary measure upon more moderate terms—a compromise, in fact—was all that could in reason be asked for, and that has been granted.

I have been engaged in parliamentary matters nearly 30 years, and am well acquainted with the rules and practice of Parliament, and I cannot recollect more than one instance of a railway company, and one of a water company, being allowed to increase its rates, and both of these were under very exceptional circumstances. I do not say positively that there are no other cases, but I believe there are not. I think, therefore, that the passing of this measure is a great concession to gas companies, and that instead of its damaging gas property, as has been represented, it will improve it, and more especially that which is held by the smaller companies, for whose relief it was specially intended.

Whatever views the companies may ultimately adopt with regard to the measure, it is essential that the matter should be represented to them in its proper light, and that they should not think they are being injured by a measure that has been passed expressly for their benefit.

The importance of this question must be my excuse for troubling you at such length.

WM. LIVESEY.

Gas and Water Companies Association, 6, Victoria Street, Aug. 8, 1873.

UNACCOUNTED-FOR GAS.

SIR,—Will you kindly permit me space in your JOURNAL for a suggestion or explanation upon the question of lost or unaccounted-for gas?

There is no doubt that the valuable papers submitted by Messrs. Emmerson and Warner to the British Association of Gas Managers supply much information upon the subject, but there was no reference made at the late meeting to what I believe to be a most important element in the consideration—viz., the condition and management of the station-meter. If this apparatus is kept in proper working order, a perfect registration of all the gas made at the works is obtained. Meters capable of passing 10,000 cubic feet of gas and upwards per hour are, or should be, fitted up with a self-acting overflow, and have a small stream of water running into and out of them. This overflow pipe should be locked up, and the key kept in the manager's possession, or the object of the arrangement would be defeated, as the man in charge could easily raise the overflow-pipe, and so raise the water-line as to give an incorrect measurement. I have seen meters where no overflow of this kind is provided, working from half an inch to 1½ inch above the water-line, which makes the meter register from 200 to 500 cubic feet of gas per ton of coal more than is actually made, and this is all put down to "unaccounted-for gas." Some time since I visited a small works, and the manager told me that he was making from 10,000 to 11,400 cubic feet of gas per ton from Pelaw Main coal, and he produced the carbonizing book in confirmation of his statement. Now, I am persuaded that, there being no cannel coal used, and no engine and exhauster on the works, 9000 to 9500 feet of gas per ton on the average for twelve months would be nearer than the station-meter would register with a high water-line, as every one acquainted with gas-making knows that there are not 11,400 feet of gas in a ton of Newcastle coal, and, therefore, that quantity cannot be extracted. But before leaving the works, I saw how this 11,400 cubic feet of gas per ton of coals was arrived at. It was the station-meter that was making the gas, not the coals. The meter was working 1½ inch above the water-line. Mr. Stevenson, speaking of the Halifax public lights, says you can make the meter register 9000, 10,000, or 11,000 feet per ton, or anything you like, by keeping a high water-line, and the unaccounted-for gas" has to bear the blame of it, which it can ill afford. I believe that not 10 per cent. of the station-meters now in work under 10,000 cubic feet per hour are fitted up with an overflow, and that those which are can be adjusted to "what you like," as they are neither sealed nor locked up, without which they are of no use whatever as a guide to the engineer or manager in arriving at the true state of his "unaccounted-for gas." I am of Mr. Anderson's opinion that a great deal of the talk about "per centage of unaccounted-for gas" is what our American friends call "all bosh," and I think that before any engineer or manager goes to the trouble and expense of stripping his mains and services to search for gas that he never actually made, and, therefore, cannot have lost, it would be well to try the effect of keeping his station-meter under lock and key, and thus satisfy himself that the gas registered by the meter is a correct statement. If this plan be effectually carried out, I venture to say that the "unaccounted-for gas" will show a much brighter appearance than it has done for years past.

R. GOOD.

Carshalton Gas-Works, Aug. 2, 1873.

A PROBLEM.

SIR,—I have acted upon the method suggested by Mr. G. Anderson in your last issue. I have also returned two tests under equal conditions, the gas being supplied to the top meter and measured out at the bottom, which indicates the extreme pressure required to pass equal volumes. Mr. G. Anderson allows 10-10ths for the vertical position of 50 feet, which must be a mistake in comparison, because I find the pressure-gauge fixed to the outlet of bottom and inlet of top meter. The top gauge indicates nearly 2-10ths, which is the increase to allow for 50 feet.

METER INDICATIONS.

Pressure.	Bottom Meter. Feet per Hour.	Pressure.	Top Meter. Feet per Hour.
5-10ths . .	10·032 + ·024	3·5-10ths . .	10·008 − ·024
10-10ths . .	17·124 − ·024	6·25-10ths . .	17·148 + ·024
20-10ths . .	22·920 − 1·284	10-10ths . .	24·204 + 1·284
	Gas from the Top.		
1·25-10ths . .	1·128 − ·072	5-10ths . .	1·200 + ·072
2· 5-10ths . .	8·076 − ·096	10-10ths . .	8·172 + ·096

Bar., 29·8; temp., 62°; specific gravity, air; the gas under equal conditions passing through a given operation.

Air required . . . 106 secs. $\frac{72 \times 72}{106 \times 106}$ = ·461 gas, air being 1·000.

Gas ,, . . . 72 ,, $\frac{106 \times 106}{72 \times 72}$ = 2·169 air, gas being 1·000.

Aug. 7, 1873.

W. L.

INCREASE OF TEMPERATURE IN A PURIFIER.

SIR,—Your JOURNAL being the medium for the diffusion of information on gas matters, might I ask some of your correspondents better informed than myself the following questions:—

I have a scrubber and four purifiers; the purifiers are 9 feet square by 5 feet deep, with five trays charged with lime 3 inches thick on each tray. The maximum quantity of gas passed through them is from 4000 to 5000 feet per hour. I deliver the gas at the scrubber inlet at a temperature never greater than the atmosphere, and the purifier inlet of course is the same. I run the gas through the purifiers one after the other. After the gas passes the first, I find the temperature raised from 10° to 15°, which it gradually loses as it passes through the other two purifiers, coming out at the same temperature that it commenced with. Some of the purifiers have a deposit of water or a little tar left in them. Now, what I am puzzled in is, why this heating takes place, and why I have a deposit of tar or water left, notwithstanding I have such ample condensation.

INQUIRER.

SOME NOTES UPON AIR GAS AND OIL GAS IN AMERICA.

TO THE EDITOR OF THE LONDON "JOURNAL OF GAS LIGHTING."

SIR,—A few brief notes upon certain processes which have run their day in America may furnish a readable appendix to Mr. Wills's lecture, read before the Society of Arts, and published in your invaluable JOURNAL of June 3, 1873.

It is well to say that no mention of the facts about to be submitted has appeared in our own journals; nor, indeed, has anything been published concerning the processes, except what has been dictated by their patentees or associates, and is, therefore, of a laudatory character.

This communication will consider the two different topics of "air gas," so called, and "oil gas," with final mention of one or two issues common to both.

I. AIR GAS.

The British office issued about seventy patents for carburetting air from 1849 to 1868 inclusive, and the American files are similarly full of this class of inventions. The policy of patent examiners in both countries seems to be the same—that of granting letters to any applicant, and for any claim. Hence, in America, at least, a maze of interferences, and of "crude and unworkable patents," as the distinguished Barlow expressed it, fit to dishearten any inventor and bewilder any student.

Two features were patented in both countries at an early date, which underlie nearly everything done since in "air gas"—the motive-power meter-wheel for air supply, and the water bath for keeping up the temperature of the carburetting liquid as its evaporation progresses. The Loveless patent (American)

and two or three English ones, the names of whose authors escape me, claim the water bath, but claim it for *cooling* the liquid! Here is a specimen brick of the whole unsubstantial air-gas edifice. Loveless should have been refused protection for his absurdity, whereas the letters patent which he received have been decided to be valid in a law court of this very State. I was a witness in the case, and have an admiration untinged with respect for the solemn ignorance of the decision.

The associated patents of Loveless and Rand have shone with more and more doubtful splendour than the *ignes minores* of fifty American competitors, only through the indefatigable industry and great personal magnetism of Mr. Rand. Yet the system deserves but casual attention at the hands of gas-makers. How dangerous would be the wholesale use of a liquid hydrocarbon which evaporates entirely at ordinary temperatures I need not argue. How unstable the illuminating vapours of the light distillates of petroleum are, is shown in the following synopsis of experiments made in the laboratory of the Manhattan Gas Company (New York city) by Mr. Schultz, its chemist, and myself:—

Experiment.	Trial.	Illuminating Agent.	Rate of Hourly Consumptn.	C. P. for 5 feet.	Temperature of Condensing Coil.	C. P. after passage thro Condensing Coil of 50 ft. of ½-in. Pipe.	Loss by Condensation. Absolut C. P.	Loss by Condensation. Per Cent.
A.	1.	Coal gas	5·016	13·67	—	—	—	—
	2.	The same	5·016		+ 3° F.	12·30	1·57	11·3
B.	1.	Carburetted air	4·564	18·01	—	—	—	—
	2.	The same	4·368		+ 3° F.	2·14	15·87	88·1
C.	1.	Carburetted air	3·284	24·78	—	—	—	—
	2.	The same	3·444		− 6° F.	9·86	14·92	60·2
	3.	The same	4·520		− 6° F.	12·83	11·95	48·2
D.	1.	1 part carburetted air, 2 parts coal gas	4·860	16·75	—	—	—	—
	2.	The same	4·296		− 6° F.	14·00	2·75	16·4
E.	1.	2 pts. carburetted air, 1 part coal gas	3·556	30·22	—	—	—	—
	2.	The same	3·708		− 6° F.	9·70	20·52	67·9
	3.	The same	3·666		+ 9° F.	18·53	11·69	38·7

These trials were made on an intensely cold day in February, 1868, in the presence of two air-gas patentees, the liquid used being gasoline of sp. gr. ·649.

The thermal range is singularly short in San Francisco and its vicinity; and this should give gasoline of 85° Beaumé an advantage over coal gas here if anywhere. The fact, however, is that coal gas of 17 candles, at 4·00 dols. per 1000 cubic feet, whips it utterly out of the field.

Carburetted air does very well where nothing better can be had, and that is saying little enough. The vehicle carries the carbon vapours only under the law of diffusion, and refuses them when the temperature falls; and there is, besides, the chilling and obstructing effect of atmospheric nitrogen, which renders inert heavy per centages of the value of the illuminants.

This paralyzing result of air-dilution has been formulated by Mr. William Farmer; and his coefficient of loss is remarkably verified in the case of every gas, within 14 and 95 candles, to which I have applied it.

II. Oil Gas.

The American gas companies have lately closed a course of debate—and in some cases of experiment—upon the practical value of gas from petroleum.

Mr. Rand's early experience as an oil-distiller, and later development and emendation of the Loveless patents, incidentally aroused him to the possibilities of petroleum and its naphthas as gas-producers. He sought to patent primary vaporization and subsequent conversion, and being faced by Leonard Gale's patent of 1859 for the same method, managed this difficulty in such a way that a reissue was granted to Gale and Rand jointly.

Nothing is said in any of the congeries of patents which speedily clustered about the original one of Gale about *fractional* vaporization and *fractional* conversion; but Mr. Rand always laid much stress in his letters and conversation upon this point of handling the material by fractions. His argument is as follows:—

"Petroleum is exceedingly complex, being composed of a large series of liquids of varying densities and varying boiling points. To vaporize properly, therefore, these liquids must be subtracted from a bulk-charge *successively*—the lightest oils, which boil at, say, 80° Fahr., first; the medium, next; and the heavy, which require, say, 700° Fahr., last of all. Beginning with a low heat, and gradually warming the still, which is an essential part of our apparatus, to the higher temperatures, we thus send over all our volatile material *truly vaporized*, being even able to work the liquid down to a coke, without possibility of choking the jacketed vapour-conduit by solid carbon on the one hand, or by re-liquefaction of vapour on the other.

"But this is not all. There exists a fixed proportion between the temperature at which any one series vaporizes, and that required to convert its vapours, without the precipitation of solid carbon, into permanent gas. So the product of the converting temperature by the converting pressure must increase as distillation proceeds. If the temperature of the retorts be constant, the exhauster must be speeded to something of a vacuum at the beginning of the charge, and slowed to suitable pressure at its close. So only will the carbon of the light oils be protected in volatile form, and the heavy vapours be truly and completely converted."

The Gale patent is, even to its verbiage, almost a duplicate of that one of James Hanson (G.B. 1854), which was so torn to shreds by Mr. Bower, and by Newton's Journal; but the above plausible annotation of his own patent enabled Mr. Rand to turn a very pretty penny out of the fears and ignorance of some of our companies. Let me here mention, *passim*, that he diluted his rich oil-gas with air, a mixture of equal volumes of the two turning a 90-candle gas into a 22-candle one, instead of being equal to 45 candles, as the verdant might expect.

Here may also be mentioned the explanation of a phenomenon which drove early gas-makers to the shaky doctrine of catalysis.

Clegg speaks of a gain in candle power of 10 or 12 per cent. by distilling a mixture of a rich with a poor coal over the mean of their products by separate distillation. Hirzel, who made oil gas by clockwork on the Continent and in Russia, is, among others, astonished at the permanence of his product. Several observers state that a *minute* dose of air rather helps than injures the cannel gases.

Now, the three dicta alike are explained by the supposition that we have always underrated the rich gases through methods of combustion not adapted to them—that we have based our expectation of the value of the mixture upon an act of injustice to the richer of the ingredients.

When a very rich gas is thinned down with a poorer one, the mixture is more nearly covered by the measuring powers of the existing photometer; and the same development of these measuring powers must occur if we employ artificial chilling, or a *slight* air dilution, as the means of reduction, in lieu of caking coal gas.

Let any gas-maker who has an experimental apparatus and a pair of Bunsen photometers take readings, 15 minutes apart, of the volume and candle power from the successive fractions of a whole charge of any of the cannels, and he will find the calculated mean candle power of his 16 or 20 experiments noticeably below the observed candle power of his whole product. Time must, of course, be allowed for diffusion before the last-named trial is made.

Let me offer the following, as an example, from my own note-book, of the behaviour of one of our caking coals.

Charge 245 lbs.

Pressure at Purifier Inlet, 16-10ths, White Heat.

Period of Charge.	Gas Registered.	Candle Power.	Product of Vol. and C. P.
1st half hour.	137 cubic feet.	24·00	3,288·00
2nd ,,	142 ,,	19·67	2,793·14
3rd ,,	149 ,,	16·00	2,384·00
4th ,,	168 ,,	14·17	2,380·56
5th ,,	184 ,,	10·14	1,865·76
6th ,,	165 ,,	5·56	917·40
7th ,,	104 ,,	2·42	251·78
8th ,,	32 ,,	1·75	55·50
9th ,,	14 ,,	1·02	14·28
Totals	1095		13,950·42

Mean calculated candle power of entire gas product—

$$\frac{13{,}950{\cdot}42}{1095} = 12{\cdot}74 \text{ candles.}$$

Observed candle power of entire charge, after standing 16 hours for diffusion . . . . . 13·20 candles.

Loss due to standing 16 hours in gasholder, being the mean of 13 experiments upon this class of coal . . . . . 00·40 ,,

Error in mean calculated candle power . . . 00·86 ,,

Totals . . . . . 13·60 ,, 13·60 ,,

The first hour's illuminating values were underrated about 3 candles.

In each of the above observations the consumptions of gas and candle were compared by direct proportion.

In a number of other similar experiments the Edgerton-Farmer "Theorem of Squares" gave absolutely correct results for coals of from 14 to 22 candles.

To return, however. Mr. Rand and his partners put naphtha gas into the works at Freehold, N.J.; Warsaw and Saratoga, N.Y.; Hamilton, O.; Memphis, Tenn., and some others, which blew up or burned up with exemplary regularity, and without exception that I am aware of. If exception there be, the *three* explosions at Memphis must be brought in to square the statement. These works were of small capacity, but their example was followed by two large and brand-new organizations—the Mutual, of N.Y. city, and the Metropolitan (now happily defunct), of San Francisco. The former of these still exists, but hugs its little naphtha less fondly than of yore.

The story of the Metropolitan Gas Company, of this city, is soon told. Their works were built over a bottomless mass of Serbonian jelly, and so suffered a premature decay. Financial paralysis, fluctuating candle power, and the unexpected behaviour of their expense account, lengthened the visages of the proprietors; and, to indulge in simile, the apple was full ready to drop when the coal-gas magnates held out their hands for it. In the regular employ of the "Metropolitans" was a "medical officer," at 300 dols. per month—proof of their anxiety that whom oil gas blew up it should not kill. After the explosion had occurred, tearing the retort-house roof clear of the plates and miserably burning six stokers, the oil gas went out for ever, and (which is the only strange episode of all) the poor fellows thus vicariously scorched recovered.

The last Memphis explosion, which was very severe, occurred when the 30-barrel vaporizing still was idle and cold. The process had been definitively abandoned a week or so before, and the company's officers had discarded all anxiety, when the blow-up took place from some cause which is utterly beyond explanation. Beyond explanation, that is, unless we accept the theory of spontaneous ignition, which has been stamped as strangely probable by certain observations of my own, and is advocated out and out by more than one distiller.

Another peculiarity of oil gas is its wedge-like action upon coal-gas scale. Many of your readers must have noticed a flinty coating deposited on the interior of wrought tubing by the continued passage of coal gas, reducing the calibre by slow accretion; yet I do not remember mention of this phenomenon in any of the admirable monographs on gas lighting published in your Journal. Oil gas splinters off this deposit, and what was of little moment so long as compact and annular, seriously obstructs the pipe when thrown confusedly into its gas way.

We find the 400 or 500 consumers meters through which this gas has passed for a year to be in very bad order. The few wet ones have their drums loaded an eighth of an inch deep with a curious impalpable brown powder which appears to be dry, but surrenders water like a sponge under pressure with the finger. The leathers of the dry meters, on the other hand, are so thoroughly rotted, that a straw can be pushed through them in any part, and the white metal is pitted as though with small-pox by some corrosive agent or other.

Intermediary between the mechanical carburetting of air and the distillation of liquid hydrocarbons, the Maxim gas machine evaporates (and partially decomposes) the gasoline by heat, the vapours taking in the combining air by an induction jet. The flow of the vapour through this jet is automatically regulated by a needle which is actuated by a collapsing diaphragm.

The product gives a tolerably steady flame from an open burner, which is unusual in this class of apparatus.

There are several subjects which I intended noticing in this letter, but it is already too lengthy. I will therefore close with my best wishes for the success of your Journal, and a cordial tribute to the uniform value of its columns.

James R. Smedberg, Consulting Engineer.

San Francisco (Cal.) Gas-Works, July 18, 1873.

Parliamentary Intelligence.

HOUSE OF LORDS.

Monday, July 28, 1873.

The following bills received the Royal Assent, by commission:—Ayr Burgh; Nottingham Gas; Mid-Lothian Water.

Tuesday, July 29.

Pollution of Rivers Bill.—A petition against this bill was presented from the Corporation of Leeds.

POLLUTION OF RIVERS BILL.

On the order of the day for going into committee on this bill,

The Duke of Northumberland, who had charge of the measure, said that at this late period of the session he felt that the only course open to him was to move the discharge of the order, but he would bring the subject under the notice of their lordships next session if the Government did not introduce a measure of their own.

The Earl of Morley said the Government were considering the subject with a view to legislation next session.

The Marquis of Salisbury said that in the select committee the circum-

stances of different localities appeared so dissimilar that it would be necessary to place in the hands of the Government so wide a dispensing power with reference to a bill such as this, that practically they would have the power to legislate as they liked. That would not be a healthy state of things. He begged to suggest whether it would not be better to appoint conservators of drainage for localities, giving these conservators extensive powers.

The motion was then agreed to, and the order was discharged.

SATURDAY, AUG. 2.

GAS AND WATER WORKS FACILITIES ACT, 1870, AMENDMENT BILL.—Returned from the Commons agreed to, with amendments. The said amendments to be considered on Monday, Aug. 4.

MONDAY, AUG. 4.

GAS AND WATER WORKS FACILITIES ACT, 1870, AMENDMENT BILL.—Commons amendments considered (according to order), and agreed to.

TUESDAY, AUG. 5.

GAS AND WATER WORKS FACILITIES ACT, 1870, AMENDMENT BILL.—This bill received the Royal Assent by commission.

HOUSE OF COMMONS.

MONDAY, JULY 28, 1873.

GAS AND WATER WORKS FACILITIES ACT, 1870, AMENDMENT BILL (Lords).—Committee deferred till Tuesday, July 29.

TUESDAY, JULY 29.

GAS AND WATER WORKS FACILITIES ACT, 1870, AMENDMENT BILL (Lords).—A petition against this bill was presented from Liverpool.

MUNICIPAL CORPORATIONS (BOROUGH FUNDS) BILL.—A petition for alteration was presented from Wells.

GAS AND WATER WORKS FACILITIES ACT, 1870, AMENDMENT BILL (LORDS).

The House went into committee on this bill.

On clause 2 (the interpretation clause),

Mr. A. PEEL moved to insert the words "corporation commissioners" after the words "the expression 'Local Act' shall mean and include any local and personal Act conferring powers upon any local authority."

The amendment was agreed to, and the same words were inserted in a subsequent part of the clause in reference to the expression "undertakers."

Mr. LEEMAN withdrew an amendment of which he had given notice, that the expression "local authority" shall mean the Local Government Board in municipal boroughs and in towns under the authority of a Local Government Board.

On clause 3,

Mr. EYKYN moved to leave out the words, "or by the local authority of such district." He said if the honourable gentleman who had charge of the bill declined to accede to his proposition, he hoped that he would provide as short a period as possible for the action of the bill.

Mr. A. PEEL opposed the amendment, and it was not pressed.

On clause 4, which enacts that undertakers may obtain Provisional Orders of the Board of Trade,

Mr. A. PEEL moved that the date "previous to the 1st day of August, 1875," should be altered to the "15th of February, 1874."

The amendment was agreed to.

The clause was then agreed to.

Clause 5, which relates to notices and deposit of documents, and clause 6, which gives power to the Board of Trade to determine on application and on objection, were agreed to without amendment.

Clause 7, which gives power to the Board of Trade to make Provisional Orders, was amended by inserting the words "each of," the effect of the amendment being that the provision relating to the amount of the dividend should apply to each of the two financial years preceding the application, instead of, as the clause stood, to the two financial years.

On clause 8, which enacts that Provisional Orders made shall be taken as valid,

Mr. A. PEEL moved to add the following proviso:—"Provided always, that at any time during the continuance of such Provisional Order, it shall be lawful for the local authority of the district in which the same is in force to apply to the Board of Trade to revoke or amend such Provisional Order; and the Board of Trade may revoke or amend the same accordingly."

The amendment was agreed to.

Clauses 9 and 10 were agreed to with some verbal amendments. On clause 11, which relates to the costs of the order,

Mr. LEEMAN moved to leave out the words "any other undertakers," and insert "any local authority."

Mr. A. PEEL said he was sorry to have to oppose this amendment. The honourable member proposed in effect that the local authorities should have power to throw the expenses for a Provisional Order on the rates, but the Government had given a pledge that they would do nothing this session to add to the burden of local rates. He hoped, therefore, that the honourable member would not press the amendment. If there was any feeling that a gas company's Act wanted amending, from the charges being too high, or from other circumstances, there would be surely sufficient spirit in the town to get up a subscription to defray the cost of applying for a Provisional Order instead of throwing the expense on the rates.

Mr. LEEMAN said surely an expenditure of this sort was for the express purpose of reducing the rates. In the case where there had been, in the words of clause 7, "an undue accumulation of profits," the application would be directly for the purpose of relieving the ratepayers; therefore, anything which the Government had said during the session as to avoiding putting new charges on the local rates of a district was utterly inapplicable to the case. He was only asking that the local authority, when a gas company was charging more than it ought, should have power to come to the Board of Trade and ask for a Provisional Order, and that the expense of that application should come out of the rates. The bill proposed to give power to the gas companies which, by reason of the increased price of coal, cannot supply gas at the ordinary rate of charge, to come to the Board of Trade for a Provisional Order to increase the price, and to take the expenses out of the sums they received for gas; and would the honourable gentleman insist that when the local authorities came and established their right to come for a Provisional Order, that they should not pay the costs of making the application out of the rates? He asked the House not to listen for a moment to the argument of the honourable gentleman, that because the Government had said that they would not during the present session put any new charge on the local rates, this proposition should not be agreed to. The effect of his proposition would be to relieve the rates, not to make any addition to them. He hoped that the honourable gentleman would not continue in his opposition, or that if he did the committee at all events would stand by him (Mr. Leeman) in the proposition that he made.

Mr. CRAWFORD said the honourable member (Mr. Leeman) sought by this little amendment to repeal the Act of last session. He (Mr. Crawford) trusted that the committee would let the clause stand as it did. The bill as it was gave a very meagre relief to companies who would be utterly bankrupt without this relief. Many of the companies were glad to accept this meagre amount of relief because it was absolutely necessary that something should be done to prevent the ruin which would fall otherwise on families whose property was invested in these companies, and they only accepted the bill because they thought that the relief it gave was fairly due to those enterprises which were limited to a most miserable amount of profit. There was not a man in this country who would go into trade unless he could make a profit of 20 or 30 per cent. on his capital, and yet these companies were limited to the charges which they were allowed to make when the price of coal was not more than one-third that it is now. Unless there was a common consent to pass the bill as it was, it would be lost, and the relief which the bill would give was absolutely necessary to prevent the companies coming to bankruptcy. Under these circumstances he trusted that his honourable friend would not insist on his amendment.

Mr. LEEMAN said the argument was entirely one-sided. His honourable friend made an *ad misericordiam* appeal to the House on behalf of these companies on account of their miserable condition. He was not taking anything from the companies. On the contrary, he was giving them all the relief that they desired; but when a company was charging more than it was entitled to, and the town established that fact, then all he asked was that the local authority might come on the common fund of the town for the expenses of the application, the common fund being relieved by the ratepayers getting the benefit of the reduced price of gas. He entreated the representatives of the companies not to offer any further opposition to such a reasonable proposition.

Mr. A. PEEL quite agreed that without such a provision as this there might be considerable difficulty as to the payment of the expenses incurred by the local authorities, and he quite agreed with his honourable friend that the local authorities ought to be at liberty to saddle the local rates with these charges. If his honourable friend would withdraw the amendment, he would, on the report, consider whether there was any way of meeting the difficulty, and whether, in reference to the Borough Funds Bill, some arrangement might be made.

Mr. EYKYN said he thought the proposition of the honourable gentleman a very fair one, and he hoped that his honourable friend, the member for York, would accept it.

Mr. LEEMAN said he could not assent to the proposition of the honourable gentleman. There was nothing to consider. Nothing in the Borough Funds Bill of last year had anything to do with this proposition, and he appealed to the good sense of the House, not at that time, when they were within four or five days of the prorogation, to deprive him of the opportunity of going to a division. He knew the difficulty. He might be placed in the same position again. The question had been fairly discussed, and it was ripe for decision.

Mr. CANDLISH said the Secretary of the Board of Trade only objected to the proposition of the honourable member for York on the ground that by accepting it he would throw a burden on the local rates, the Government being under an engagement not to add to the local rates this session. Now, he would ask his honourable friend to consider that the ratepayer and the gas consumer were, generally speaking, one and the same person; and if the grievance were one of price, it was perfectly clear that if there was an addition to the local rates of a penny, twopence would be saved in the price of gas. But there was another point; the question might be the charge for the public lamps. If the reference to the Board of Trade was on the question of what should be the sum to be charged for the public lamps, it was perfectly clear that every ratepayer was concerned, and every ratepayer would have his rates not increased but reduced.

Mr. CRUM-EWING, considering the smallness of the sum that would be chargeable on the rates, thought it hardly worth while to contest the matter; but, at the same time, if the honourable gentleman persisted in his amendment, he would vote for it.

Mr. CRAWFORD asked the committee to observe the effect of this amendment. It was really attempting a new kind of legislation against gas companies. The local Acts under which they were constituted had been obtained, in many instances, with considerable opposition from the local government of the place. In every one of these Acts every care had been taken that the consumers, the public, should not be surcharged. The amendment would introduce a new power which the committee upstairs had refused, and he trusted that the committee would not agree to grant this new power.

Mr. WHITWELL said this was one of the worst Acts ever introduced, inasmuch as it is to enable trading companies, taking advantage of the rise in prices of fuel, to get special liberty with the permission of the Board of Trade, to increase the price of the commodity they manufactured. Now he knew no manufacturing establishment which ever did the like. These companies were bound not to divide more than 10 per cent., and if the sums they received would enable them to divide more, they were bound to reduce the price of gas; but instead of doing that they lay down pipes where it is not necessary, and spread their works over a larger area.

Mr. LEEMAN said before the committee divided he wished to say one word in consequence of what had fallen from his honourable friend near him (Mr. Crawford). He (Mr. Leeman) asserted distinctly that in a large number of the towns of this country—he knew that for his own city it was so—the statement which the honourable member had made, that in these Acts there was power in the local authorities to have the rates revised, had no foundation. It was not the case in his own city—it was not the case of the town of his honourable friend near him, and it was perfectly well known that many of these towns were forced into legislation. It was only in modern Acts that power was given to revise the prices. That power was not given in the old Acts.

The committee then divided on the question that the words "any other undertakers" stand part of the clause. The numbers were—

Ayes	21
Noes	22

Mr. LEEMAN then moved to insert the words "any local authority."

The committee again divided—

For the insertion of the words	41
Against	1
Majority for	—40

The announcement of the numbers was received with much laughter.

The clause was then ordered to stand part of the bill.

The remaining clauses were then agreed to with some verbal amendments, and the bill was ordered to be reported, and, as amended, to be considered on Wednesday, July 30.

WEDNESDAY, JULY 30.

GAS AND WATER WORKS FACILITIES ACT, 1870, AMENDMENT BILL (Lords).—The consideration of this bill, as amended, deferred till Thursday, July 31.

THURSDAY, JULY 31.

GAS AND WATER WORKS FACILITIES ACT, 1870, AMENDMENT BILL (Lords).—The consideration of this bill, as amended, deferred till Friday, August 1.

FRIDAY, AUG. 1.

GAS AND WATER WORKS FACILITIES ACT, 1870, AMENDMENT BILL (Lords).—The report of amendments on this bill was brought up and agreed to without discussion, and the bill was then read a third time and passed.

MONDAY, AUG. 4.

METROPOLITAN WATER COMPANIES.—Statement of the accounts of the

Metropolitan Water Companies for the year 1872, which have been prepared in pursuance of the Metropolis Water Act, 1871, presented, and ordered to be printed.

TUESDAY, AUG. 5.

RIVERS POLLUTION.—Copy of third report of commissioners presented.

GAS AND WATER WORKS FACILITIES ACT, 1870, AMENDMENT ACT.

AN ACT TO EXTEND AND AMEND THE PROVISIONS OF THE GAS AND WATER WORKS FACILITIES ACT, 1870.

Be it enacted by the Queen's most Excellent Majesty, by and with the advice and consent of the Lords, Spiritual and Temporal, and Commons, in this present Parliament assembled, and by the authority of the same, as follows:

Short Title.

1. This Act may be cited for all purposes as "The Gas and Water Works Facilities Act, 1870, Amendment Act, 1873."

Interpretation.

2. In this Act the several words and expressions to which by "The Gas and Water Works Facilities Act, 1870," meanings are assigned, have the same respective meanings as in the said Act:

The expression "special Act" shall mean and include any local and personal Act conferring powers upon any local authority, corporation, commissioners, company, companies, or persons, for the construction and maintenance, or the maintenance and continuance of gas-works, and the manufacture and supply of gas in any district, and any Act amending the same, and shall include any Provisional Order made and confirmed under the authority of "The Gas and Water Works Facilities Act, 1870," so far as such Act or Provisional Order is in force.

The expression "undertakers" in relation to a special Act shall mean the local authority, company, companies, or persons acting in execution of such special Act.

The expression "prescribed" shall mean prescribed by the special Act.

Cases to which Act applies.

3. This Act shall apply where the amendment of any special Act in force in any district is required by the undertakers, subject as in this Act hereinafter provided, or by the local authority of such district in relation to all or any of the matters following:—

1. The prescribed illuminating power of the gas to be supplied;
2. The prescribed maximum price of the gas to be supplied;
3. The prescribed pressure at which the gas is to be supplied;

And such matters, or any one or more of them, as the case may be, shall for the purposes of this Act be deemed to be included in the term "amendment of a special Act."

Undertakers may obtain Provisional Orders from Board Trade.

4. Subject to the provisions of this Act, Provisional Orders making an amendment of a special Act may be obtained on the application of the undertakers, or of the local authority of the district in which the same is in force, made previous to Feb. 15, 1874.

Notices and Deposit of Documents as in Schedule.

5. The undertakers or local authority intending to make an application for a Provisional Order in pursuance of this Act shall proceed as follows:—

1. During the thirty days immediately preceding their application, they shall publish notice of their intention to make such applicatien by advertisement, according to the regulations contained in Part I. of the schedule to this Act.
2. On or before the fifth day after the last publication of such advertisement, they shall deposit the documents described in Part II. of the said schedule, according to the regulations therein contained.

Power for Board of Trade to determine on Application and on Objection.

6. The Board of Trade shall consider the application, and inquire as to the propriety of proceeding upon such application, and they shall consider any objection thereto that may be lodged with them on or before such day as they from time to time appoint, and shall determine whether or not the application may be proceeded with.

Power for Board of Trade to make Provisional Order.

7. Where, with a view to prevent undue loss to any undertakers arising from unusual increase in the cost of production of gas, or to the prevention of undue accumulation of profits by undertakers, it appears to the Board of Trade expedient and proper that the application should be granted, with or without addition or modification, or subject or not to any restriction or condition, and it has been proved to their satisfaction that all the requirements of this Act have been in all respects complied with, the Board of Trade may settle and make a Provisional Order accordingly; provided that the operation of such Provisional Order shall be limited to such period (not exceeding three years) as the board shall therein prescribe; provided also that where any addition shall be made by any such Provisional Order to the maximum price of gas prescribed by the special Act, provision shall be made by such Provisional Order that the undertakers, being a person, company, or companies carrying on business under the special Act for his or their own pecuniary benefit, shall not divide more than at the rate of 5 per cent. per annum on their ordinary capital for any half year in which they shall have charged more than the maximum price prescribed by the special Act, or if such undertakers shall not have paid a dividend of 5 per cent. on such capital for the two financial years next preceding the application, more than such sum as shall have been the average amount of the dividend in such two years, and before allowing any such addition the Board of Trade shall ascertain the amount of dividend paid on such capital during the said two years, the contracts, if any, for coal still in force, the present and former prices received by them for coke and residual products, the amount of gas unaccounted for and lost during each of the said two years, and their charges for gas during the same period.

Provisional Orders made to be taken as valid.

8. Every Provisional Order made by the Board of Trade under the authority of this Act shall be signed by a secretary or assistant secretary of the Board of Trade, and shall take effect from a day subsequent to the date of the signing of the same to be named therein (in this Act referred to as the commencement of such Provisional Order), and every such order purporting to be so signed shall be conclusive evidence of every fact and circumstance necessary to authorize the making thereof, and shall be deemed and taken to all intents and purposes whatsoever to have been made in pursuance of and in conformity with the provisions of this Act; and so long as such Provisional Order shall continue in force it shall be of the same force and effect as an Act of Parliament.

Provided always that when an application under this Act has been made by any undertakers for the grant of a Provisional Order for the amendment of a special Act, it shall be lawful for the local authority of the district in which such special Act is in force at any time before the 15th of February, 1874, to apply to the Board of Trade for a grant of a Provisional Order for the amendment of such special Act with respect to the illuminating power or the maximum price of the gas to be supplied by the undertakers, or with respect to the pressure at which gas is to be supplied.

Provided also that at any time during the continuance of any Provisional Order granted to any undertakers, it shall be lawful for the local authority of the district in which the same is in force, to apply to the Board of Trade to revoke or annul such Provisional Order, and the Board of Trade may revoke or amend the same accordingly.

Publication of Provisional Order as in Schedule.

9. When a Provisional Order has been made as aforesaid, and delivered to the persons who applied for the same, they shall before the day named for the commencement of such Provisional Order deposit and publish the same by advertisement, according to the regulations contained in Part III. of the schedule to this Act.

Confirmation of Provisional Order by Act of Parliament.

10. The Board of Trade shall, as soon as they conveniently can after the making of any Provisional Order under the authority of this Act, procure a bill to be introduced into either House of Parliament for an Act to confirm the Provisional Order, which shall be set out at length in the schedule to such bill.

If, while any such bill is pending in either House of Parliament, a petition is presented against any Provisional Order comprised therein, the bill, so far as it relates to the order petitioned against, may be referred to a select committee, and the petitioner shall be allowed to appear and oppose as in the case of a bill for a local and personal Act.

In case either House of Parliament shall refuse to confirm any Provisional Order under this Act, notice of such refusal shall forthwith be given by the Board of Trade to the persons who applied for the same, and to the local authority of the district to which such Provisional Order relates, and the Board of Trade shall cause a copy of such notice to be published as an advertisement once in the local newspaper in which the original advertisement of the intended application was published, or in such other newspaper circulating in such district as the Board of Trade may think proper.

Every such notice shall be signed by a secretary or assistant-secretary of the Board of Trade, and from and after the expiration of a day to be named therein, the Provisional Order to which it relates shall cease to have any operation: Provided always, that such notice shall not affect any act, matter, or thing done or suffered, or any liability incurred under such Provisional Order nor the effect and validity of such Provisional Order previous to the day named in such notice.

The production of a copy of such notice purporting to be signed in manner by this section prescribed shall be evidence of the facts stated therein.

The Act of Parliament confirming any Provisional Order under this Act shall be deemed a Public General Act.

Costs of Order.

11. The costs of and connected with the preparation and making of a Provisional Order, and all proceedings in relation thereto, shall be paid by the persons applying for the same, and the Board of Trade may require them to give security for such costs before they proceed with the Provisional Order.

The costs incurred by undertakers, being a company, companies, or person carrying on business under the special Act for their or his own pecuniary benefit, in applying for a Provisional Order under this Act shall, if the same be not obtained, be paid out of the sum applicable to dividend, and if the same be obtained, such costs shall be charged to ordinary expenses of management; and such costs incurred by any other undertakers may be paid by them out of any funds which may from time to time be in their hands, and which may be applicable to the purposes of the special Act, and such costs incurred by any local authority may be paid by them out of the borough rate or district rate leviable by them for the purposes for which they are constituted by any general or special Act.

Power of Board of Trade to revoke, amend, extend, or vary Provisional Order.

12. Where under the Gas and Water Works Facilities Act, 1870, or this Act, the Board of Trade have made any Provisional Order, they may from time to time revoke, amend, extend, or vary such Provisional Order by a further Provisional Order.

Every application for such further Provisional Order shall be made in like manner and subject to the like conditions as the application for the former Provisional Order.

Every such further Provisional Order shall be made and confirmed in like manner in every respect as the former Provisional Order.

Authorizing and regulating Inquiries by the Board of Trade for Purposes of Gas and Water Works Facilities Act, 1870, and this Act.

13. Where, in relation to any application for a Provisional Order under the Gas and Water Works Facilities Act, 1870, or under this Act, it is in the opinion of the Board of Trade expedient that an inquiry should be held, they may order and direct such inquiry to be held at such time and place as they may think proper, subject to the provisions following:—

1. The inquiry shall be held in public before an officer or officers to be appointed in that behalf by the board, hereinafter called the commissioner or commissioners.
2. Ten days notice at the least shall be given by the commissioner or commissioners of the time and place at which the inquiry is to be commenced.
3. The inquiry shall be commenced at the time and place so appointed, and the commissioner or commissioners may adjourn the inquiry from time to time as may be necessary to such time and place as he or they may think fit.
4. The commissioner or commissioners by summons shall, on the application of any party interested in the inquiry, require the attendance before him or them, at a place and time to be mentioned in the summons, of any person to be examined as a witness before him or them, and every person summoned shall attend the commissioner or commissioners, and answer all questions touching the matter to be inquired into, and any person who wilfully disobeys any such summons or refuses to answer any question put to him by the commissioner or one of the commissioners, for the purposes of the said inquiry, shall, on summary conviction before two justices, or in Scotland before any sheriff or sheriff substitute, be liable to a penalty not exceeding £5: Provided always, that no person shall be required to attend in obedience to any such summons unless the reasonable charges of his attendance shall have been paid or tendered to him, and no person shall be required in any case in obedience to any such summons to travel more than 10 miles from his place of abode.
5. The commissioner or commissioners shall make a report to the Board of Trade in writing, and shall deliver copies of the report upon request to all or any of the parties to the inquiry.

Rules for carrying Acts into effect.

14. The Board of Trade may from time to time make, and, when made, may rescind, annul, or add to rules with respect to the following matters:—

The proceedings to be had before the board under the Gas and Water Works Facilities Act, 1870, or this Act, and

As to any other matter or thing in respect of which it may be expedient to make rules for the purpose of carrying the said Act or this Act into execution.

Any rules made in pursuance of this section shall be deemed to be within the powers conferred by the said Act or this Act, and shall be of the same force as if enactad in the said Act or this Act, and shall be judicially noticed.

Any rules made in pursuance of this section shall be laid before Parliament within three weeks after they are made, if Parliament be then sitting; and if Parliament be not then sitting, within three weeks after the beginning of the then next session of Parliament.

Act not to apply to the Metropolis.

This Act shall not apply to any place within the metropolis, as the same is defined in the Metropolis Management Act, 1855.

SCHEDULE.

PART I.

Advertisement of intended Application.

1. Every advertisement is the contain the following particulars:
   The objects of the intended application.
   The name of an office, either in London or at the place to which the intended application relates, at which printed copies of the draft Provisional Order, when deposited, and of the Provisional Order when made, will be obtainable as hereinafter provided.

2. The advertisement is to be inserted twice at least in some one and the same newspaper published in the district affected by the proposed Provisional Order; or if there be no such newspaper, then in some one and the same newspaper published in the county in which such district, or some part thereof, is situate; or if there be none, then in some one and the same newspaper published in some adjoining or neighbouring county. Such advertisements shall be so published that there shall be an interval of not less than 10 days between each publication.

PART II.

1. The documents to be deposited at the office of the Board of Trade—
   1. A copy of each of the newspapers containing the advertisement.
   2. A memorial signed by the persons applying for a Provisional Order, addressed to the Board of Trade, and praying for a Provisional Order.
   3. A printed draft of the Provisional Order as proposed, with any schedule referred to therein.

2. A sufficient number of such printed copies are to be deposited at the office named in that behalf in the advertisement; such copies to be there furnished to all persons applying for them at the price of not more than 1s. each.

3. The said memorial (to be written on foolscap paper, bookwise, with quarter margin) is to be in the following form, with such variations as circumstances require:—

[*Short title of undertaking.*]

To the Board of Trade,

The memorial of of :

Sheweth as follows:

1. Your memorialists have published, in accordance with the requirements of the Gas and Water Works Facilities Act, 1870, Amendment Act, 1873, the following advertisement:

[*Here advertisement to be set out verbatim.*]

2. Your memorialists have also deposited, in accordance with the requirements of the said Act, copies of the said advertisement and [*Here state deposit of the several matters required by Act.*]

Your memorialists, therefore, pray that a Provisional Order may be made in the terms of the draft proposed by your memorialists, or in such other terms as may seem meet.

A. B.
C. D.
E. F.

PART III.

Deposit and Advertisement of Provisional Order when made.

1. The Provisional Order shall be published as an advertisement once in the local newspaper in which the original advertisement of the intended application was published, or in such other newspaper circulating in the district to which such Provisional Order relates as the Board of Trade shall direct.

2. A sufficient number of printed copies of the Provisional Order shall be deposited at the office named in that behalf in the advertisement, such copies to be there furnished to all persons applying for them at the price of not more than 1s. each.

BOARD OF TRADE RULES.

The Board of Trade, under the powers conferred upon them by section 14 of the Gas and Water Works Facilities Act, 1870, Amendment Act, 1873, have made the following rules with respect to applications for the grant of Provisional Orders under that Act:—

1. The publication of notices required by section 5 of the Gas and Water Works Facilities Act, 1870, Amendment Act, 1873, and the deposit of documents required by the same section, is to be made in manner prescribed by Parts I. & II., respectively of the schedule to the said Act.

2. The advertisement must state that all persons desious of making any representation to the Board of Trade, or of bringing before them any objection respecting the application, may do so by letter addressed to the assistant-secretary of the Railway Department of the Board of Trade on or befcre a day to be named in the advertisement, not being less than 21 days from the date of the first publication of the advertisement, and that copies of their objections must at the same time be sent to the promoters.

3. The draft Provisional Order must be printed on one side of the paper, so as to leave the back of the page blank, and any schedule annexed must begin a new page. The name of the promoters, or of their agents, must be printed on the outside of every draft Provisional Order.

4. The promoters will be required to pay a fee of £35 towards the expense of settling the Provisional Order; this sum must be paid to the officer of the Board of Trade with whom the draft Provisional Order is deposited, and at the time of the deposit.

5. The draft Provisional Order, which is to be deposited at the Board of Trade on or before the fifth day after the last publication of the advertisement, must be deposited in triplicate, and must be accompanied by a statement of

(*a.*) The amount of dividend, if any, paid by the undertakers during the two financial years preceding the application, and the rate per cent. per annum of such dividend upon the paid-up capital of the company.

(*b.*) The particulars of all contracts for coal still in force, showing the following matters:—
   (*a.*) The amount of coal contracted for in each case;
   (*b.*) The date and duration of each contract;
   (*c.*) The price of coal per ton under each contract;

(*c.*) The price received for coke and other residual products during the said two years, and the market price of the same at the time of the application for the Provisional Order.

(*d.*) The amount of gas made, and the amount unaccounted for during each of the said two years.

(*e.*) The price per 1000 cubic feet charged for gas during the same period.

The foregoing statement must in all cases be verified by an affidavit made by some person well acquainted with the facts.

6. The draft deposited at the Board of Trade must also be accompanied by a printed copy of the special Act or Acts relating to the undertaking which is the subject of the application.

7. The promoters must be prepared to prove compliance with the provisions of the Act concerning deposit and publication when required to do so. Six days notice will be given of the day and hour at which the promoters are to attend for the purpose at the Board of Trade. Printed forms of proof will be supplied on application to the Railway Department, which should be filled up by the promoters, and brought to the Board of Trade at the time fixed for proof.

8. Any objections to the Provisional Order which it is intended to urge on the Board of Trade must be sent in to that office on or before the day named in the advertisement. A copy of such objections must also be sent at the same time to the promoters, and in forwarding the objections to the Board of Trade the objectors, or their agents, should state that this has been done.

9. When an order has been granted, the promoters must deposit at the Board of Trade, within three days after publication, a copy of the local newspaper containing the advertisement of the order, and prove that the advertised order is a correct copy of the order delivered by the Board of Trade for publication, and that a sufficient number of printed copies of the order have been deposited for sale at the office named in the original notice, and the price for which they may be obtained (see part III. of schedule).

10. All memorials, objections, and other documents sent to or deposited with the Board of Trade must be on common foolscap paper.

W. R. MALCOLM.

Board of Trade, Railway Department, Aug. 6, 1873.

Legal Intelligence.

COURT OF CHANCERY.—FRIDAY, AUG. 1.

(*Before the* LORD CHANCELLOR, *for the Master of the Rolls.*)

GOAD *v.* HARVEY.

Mr. SOUTHGATE, Q.C., and Mr. BATTEN appeared for the plaintiff; and Sir R. BAGGALLAY, Q.C., and Mr. OWEN for the defendant.

This was a motion for an injunction to restrain the defendant from distilling coal tar, or manufacturing carbolic acid and creosote, or allowing the escape of any gas, smoke, or vapour from his factory so as to occasion damage or annoyance to the plaintiff or his tenants. The plaintiff is the owner of three houses in Laira Place, Plymouth, and is the occupier of No. 5, Laira Place. The defendant's works were erected last March on a piece of land belonging to the South Devon Railway Company, near Laira Bridge, about 1580 feet from the plaintiff's house. Since the 26th of March, with an interval from the 16th of May to the 10th of June, during which the works were closed for alterations, the defendant has been manufacturing light and heavy naphtha, creosote, and anthracene, by the distillation of coal tar at a high temperature. The vapour given off during the process was described by the plaintiff and his witnesses as offensive in the highest degree, depositing flakes of tarry matter on the roofs of the houses, and thus polluting the rain water, and, when inhaled, taking away the appetite and even causing sickness. It was also said to be injurious to health, and destructive of the vegetables growing in the adjoining market gardens. A memorial was presented to the Local Board of Health in May, praying that steps might be taken to abate the alleged nuisance, but the board took no action thereon, and the bill was filed on June 3, before the alterations were completed. The defendant admitted that some vapour might have escaped prior to the alterations, but such vapour, he alleged, was disinfectant in its character, and therefore by no means injurious to health, while the smell, if unpleasant (which was a matter of taste), was no worse than people living in a region of manure-works, soap-works, and sugar refineries ought to put up with; and he wholly denied that any vapour (except ordinary coal smoke) had escaped, or possibly could escape, from his works since the alterations.

The evidence having been read,

The LORD CHANCELLOR, without calling on the defendant's counsel, said the evidence did not justify him in granting an injunction at the present stage of the cause. It was not an information, but a bill by a private person, complaining of a private nuisance, and the only question for the court to consider was what damage that person had sustained. This rendered a good deal of the evidence irrelevant, for the plaintiff could not, as he proposed to do, sue on behalf of all other persons in the same interest, and evidence of other persons having sustained damage had nothing to do with the question before the court. What were the facts of the case? The works were going on until the 16th of May, when they stopped, and were not renewed until the 10th of June, a week after the filing of the bill. During the time when the works were in abeyance a correspondence occurred between the plaintiff's present solicitors, who were then acting for a Mr. Northcott, one of the plaintiff's tenants, and the defendant. In the course of this correspondence the defendant wrote a letter, in which he said:

> I fail to see the justice or propriety of attacking works which are not yet completed, and, when completed, will never cause trouble or annoyance to your client or any other person if properly conducted. I am willing to submit them to inspection when complete, either by the Government Inspector or some other competent person, and will act on any suggestions he may make.

That offer, his lordship regretted to say, had not in any way been taken advantage of. The question was, not what was the state of affairs prior to the alterations, but what was the state of affairs at the time of the filing of the bill. The opinion of Dr. Letheby and other scientific witnesses of eminence was that the apparatus was now so constructed as to prevent the escape of noxious effluvia to such an extent as to create a nuisance. The evidence of some gentlemen who, without inspecting the works or going to the plaintiff's house, deposed that, to the best of their judgment, a nuisance would still be created, must be regarded as speculative, and could not be taken into account. The plaintiff had sworn five affidavits, none of which made out a case of nuisance existing after the resumption of business, and his lordship was satisfied, upon the materials before him, that the plaintiff had no reason to complain of effluvia from the work since that time.

Motion refused, defendant's costs to be costs in the cause.

TUESDAY, AUG. 5.

BERTHOUD *v.* WARNER.

This was a sewage nuisance case. The plaintiff resides at Hale End, Walthamstow. His grounds are traversed by a brook called Ching Brook, a tributary of the Lea. A few hundred yards from the plaintiff's property is a lake of about eight acres in extent belonging to the defendant, having an overflow or outfall into Ching Brook. Until recently this lake received the drainage of the defendant's house, and of the Castle Inn and 94 other houses in the parishes of Woodford and Walthamstow, and it had become excessively foul and unwholesome in consequence. Being advised that the lake might become a source of infection if this state of things were allowed to continne, the defendant last November diverted the drainage from the lake, and carried it by a short cut, with catchpits here and there for arresting the solid sewage, into Ching Brook, at a point above the plaintiff's premises. The plaintiff threatened proceedings while the cut was making, and after it was made he filed the present bill, praying that the defendant might be restrained from allowing the drainage to flow into Ching Brook.

Mr. SOUTHGATE, Q.C., and Mr. A. G. MARTEN, for the plaintiff, gave the defendant credit for intending to abate a nuisance, but submitted that he had no right to create another nuisance in doing so. Before the diversion of the sewer, the Ching Brook only received diluted sewage occasionally when the lake was flooded, but now it received it at all times, and undiluted, and that was a substantial injury against which the court would relieve.

Sir RICHARD BAGGALLAY, Q.C., and Mr. CECIL RUSSELL, for the defendant, contended that a mandatory injunction ought not to be granted where the real

ground of complaint was possible injury in future. The injury proved was very trifling, for Ching Brook was about as foul as it could be before the defendant turned the drainage into it.

The LORD CHANCELLOR, without calling for a reply, said the plaintiff was entitled to a decree. The defendant, very likely with the best intentions, had done what he had no right to do. He had turned the sewage into the brook in an undiluted state, whereas previously it only passed into the brook after dilution with the water of the lake. The defendant must be restrained from allowing any sewage to flow into the brook, and pay the costs of the suit.

VICE-CHANCELLOR'S COURT.—SATURDAY, AUG. 2.

(Before Vice-Chancellor Sir JAMES BACON.)

THE ATTORNEY-GENERAL *v.* THE BIRMINGHAM CORPORATION.

It will be recollected that the Corporation of Birmingham are under injunction in an information brought at the relation of Sir Charles Adderley, restraining them from connecting any new sewers with the river Tame, on which he has property below the town. They are also under injunction restraining them from continuing the existing pollution of the river; but proceedings on this part of the injunction have been stayed from time to time to allow them to construct sewage works, and are now stayed over the long vacation. The corporation have constructed sewage-works at Saltley, and are under injunction on an information brought at the relation of inhabitants of Gravelley Hill, a suburb of Birmingham, near Saltley. The latter injunction restrains them from carrying on their sewage works so as to create a nuisance. Proceedings on this injunction are also stayed over the long vacation. The Birmingham Corporation, as the local sewage authorities, have constructed a main sewer, which, after the sewage has undergone a certain deodorizing process at Saltley, discharges the matter into the Tame. This was a motion to be allowed to connect sewers from a large part of Birmingham which had been built of late years with the main sewer. Part of the area intended to be thus drained is absolutely without sewers, and other parts discharge their sewage into a small tributary of the Tame. The application was made on the ground of urgent necessity and apprehended immediate danger to Birmingham from cholera and other diseases likely to arise from insufficient drainage in hot weather, and was founded on a report from the council's medical officer made in February last, and on an inquiry directed in consequence of the report which was concluded in May.

Mr. AMPHLETT, Q.C., and Mr. WILLIAM PEARSON appeared for the corporation; Mr. EDDIS, Q.C., and Mr. RODWELL for Sir Charles Adderley.

The VICE-CHANCELLOR said that in 1858 Sir Charles Adderley invoked the aid of the law, and from that time to this he had the protection of an injunction; and now, upon the eve of the vacation, it was sought to take away that protection on grounds totally insufficient. It appeared that as early as February last the attention of the corporation was called to the state of facts, and up to the end of July they had taken no steps. They complained that by reason of the injunction the health of the town was endangered. They were able to make what sewers they pleased, and to expend what sums they pleased on drainage. The whole world was open to them with the single exception that they must not discharge their sewage into the Tame. There was no kind of excuse for the delay, and the application was most unreasonable, and must be refused.

Miscellaneous News.

BERLIN WATER-WORKS COMPANY, LIMITED.

The Twentieth Half-Yearly General Meeting was held at the London Tavern, on Tuesday, Aug. 5.—J. C. SIM, Esq., in the chair.

The SECRETARY (Mr. Fesch) read the following report of the directors, to which the engineer and manager's report and the audited financial statement were annexed.

The directors have the pleasure of submitting their usual half-yearly report to the shareholders of the Berlin Water-Works Company.

The net revenue account shows a steady increase in the amount derived from water-rates during the half year just closed—viz., £6900 in excess of the corresponding half year in 1872, and an increase of about £1200 over that of the half year ending the 31st of December last. The considerable increase in the house services account—viz., £2600 over last half year—is partly owing to the large building operations still in progress in Berlin, and also to the completion of certain works begun in 1872.

The working expenses show a small decrease in spite of a considerable increase in the prices of labour and materials, and notwithstanding that about 14 per cent. more water has been pumped into the town than during the corresponding half year in 1872.

The general revenue account shows an amount of £45,362 1s. 7d. to the credit of the company. From this the directors recommend the usual interim dividend for the half year at the rate of 10 per cent. per annum, free of income-tax, which will absorb £30,000, leaving a balance of £15,362 1s. 7d. to be carried forward.

The CHAIRMAN, in moving the adoption of the report, said he need not expatiate upon the measures adopted, with the sanction of the shareholders, in the outlay of capital on new filters, in the maintenance of the works and machinery, in the extension of services, and in the thorough development of the company's great enterprise, because on the present occasion he had an important communication to make to the meeting. As it had always been the custom of the directors to take their shareholders into council when any event of interest occurred, he must now crave their attention while he endeavoured to set before them the treaty originated with the municipality of Berlin for the purchase of the works of the company. Towards the end of January last, a Cabinet order of the Emperor was issued authorizing the municipality of Berlin to acquire the water-works. The municipality thereupon appointed a committee to negotiate with the company for the purchase of their undertaking. Those negotiations were continued until June, when the committee intimated their willingness to advise the Municipal Council to offer £1,200,000 for the transfer of the works and the whole of the company's interest, as and from the 30th of that month, they taking over from the company the whole of their assets, accruing dividends, and everything else, leaving the company to pay their liabilities for works in progress on existing contracts and other things. Although the offer appeared like £20 per £10 share for the 60,000 shares of the company, it would have left them to pay their liabilities, debts, and compensations over and above the total of the company's capital. The directors therefore respectfully declined to submit that offer to their fellow-shareholders. It was only a tentative offer on the part of the committee that they would propose to the council to give that sum if the board were ready to accept it, or submit it for the consideration of their shareholders. The directors, however, declined it, and they thought the most straightforward course for them to pursue was to name the sum which they felt would be sufficient, and to adhere to that. They accordingly suggested to their representative at Berlin to propose an addition of £50,000 to the offer already made, which they considered would be enough to pay the debts and liabilities of the company over and above their capital, and leave the original sum of £1,200,000 clear for the payment of £20 per share to every shareholder. On the 1st of August the committee of the municipality intimated to the company's representative in Berlin, Mr. Magnus, that they were prepared to advise the payment of that sum by the corporation for the transfer of the works as and from the 1st of July last. The works were to be handed over clear of any incumbrance, together with the landed property of the company, pipes, stores, estimates, drawings, &c., the business to be carried on from the 1st of July, at the cost and for the benefit of the municipality, interest at the rate of 5 per cent. upon the purchase-money being paid by them; the sewers-fund (which was the accumulation of the state moiety of surplus profits above 10 per cent., and of which the company were only custodians) to be paid over to the municipality. On the other hand the reserve-fund, whatever the amount might be up to the 1st of July, was to be retained by the company. They had £8000 in Consols, and there was a balance on the general revenue account, after payment of the interim dividend now recommended, of £15,362, the company's portion of which, amounting to between £8000 and £9000, would not be touched by this agreement. Out of these sums of course there would be various compensations to be made. There had not been time to call a special meeting for the consideration of the proposal of the Municipal Committee, and all that the directors desired on the present occasion to do was to place the information before the shareholders, and ask their counsel whether they should proceed with the treaty for the sale of the works, leaving them at the proper time to say "aye" or "no" to the proposition. It would be to the directors a source of some little regret to bid farewell to an enterprise which it had been their pleasant duty to foster, and in the management of which they had been successful, but their recommendation to the shareholders was to accept the offer which would give them £20 per share clear of all deductions. He now simply moved the adoption of the report.

Mr. PICKERSGILL-CUNLIFFE, in seconding the motion, entered at some length into a consideration of the position of the company, and endorsed the recommendation of the chairman as to the proposed terms of purchase, which he thought were advantageous to the shareholders.

The motion was put and carried unanimously, as was also a motion by the CHAIRMAN, seconded by Mr. RUCKER, for the payment of the interim dividend recommended in the report.

Mr. MOSCROP, Mr. FRESHFIELD, and another shareholder expressed their satisfaction at the progress of the negotiations, and the confidence which they believed the shareholders, as a body, felt in leaving those negotiations to be completed by the board.

A vote of thanks to the directors terminated the proceedings.

METROPOLIS WATER SUPPLY.

The Registrar-General publishes the following returns furnished to him by the London water companies, of the average daily quantity of water supplied during the month of June, 1873:—According to their returns, 120,204,176 gallons, or 546,143 cubic mètres of water (equal to about as many *tuns* by measure, *tons* by weight), were supplied daily; or 238·5 gallons (108·4 decalitres), rather more than a *ton* by weight to each house, and 33·6 gallons (15·3 decalitres) to each person.

COMPANIES.	Number of Houses, &c., supplied in June, 1872.	Number of Houses, &c., supplied in June, 1873.	Aver. Daily Supply of Water in Gallons* during June, 1872.	Aver. Daily Supply of Water in Gallons* during June, 1873.
Total supply	496,495	504,034	114,860,743	120,204,176
From Thames	231,740	236,267	59,942,767	62,757,259
,, Lea and other Sources	264,755	267,767	54,917,976	57,446,917
THAMES.				
Chelsea	28,154	28,270	9,443,000	8,566,000
West Middlesex	43,580	44,810	10,296,650	10,180,458
Southwark and Vauxhall	78,876	79,396	16,449,194	18,265,468
Grand Junction	33,013	34,243	12,212,783	12,346,632
Lambeth	48,117	49,548	11,541,200	13,398,700
LEA AND OTHER SOURCES.				
New River	120,133	121,194	26,789,000	26,295,000
East London	103,513	104,637	21,012,700	24,095,000
Kent	41,109	41,936	7,116,276	7,056,917

* Including that for manufactures and for various purposes other than for domestic consumption.

Note.—The return for June, 1873, as compared with that for the corresponding month of 1872, shows an increase of 7539 houses, and of 5,343,433 gallons in the daily supply of water.

Dr. Frankland, F.R.S., reports that the metropolitan waters were all clear and colourless when drawn from the companies' mains for analysis during July. Taking unity to represent the organic impurity in a given volume of the Kent Company's water, the proportional amount in the water supplied by each of the other metropolitan companies was:—New River 1·5, East London 2·1, West Middlesex and Southwark 2·4, Grand Junction 2·5, Chelsea 2·6, and Lambeth 2·7. As is usually the case during dry weather the river waters maintained their improved quality, although the high temperature at which they were delivered to the consumer rendered them "vapid and unpalatable." The water delivered by the East London Company exhibited a considerable reduction in the evidence of "previous sewage contamination," in consequence of the large storeage capacity possessed by that company. The Lambeth Company's water "continues to be inferior in quality to that supplied by any other company drawing from the Thames."

The following are the returns of the Association of Medical Officers of Health relating to the composition and quality of the metropolitan waters, in July, 1873:—

NAMES OF WATER COMPANIES.	Total Solid Matter per Gallon.	Oxygen required by Organic Matter, &c.	Nitrogen. As Nitrates, &c.	Nitrogen. As Ammonia.	Hardness. Before Boiling.	Hardness. After Boiling.
Thames Water Companies.	Grs.	Grs.	Grs.	Grs.	Degs.	Degs.
Grand Junction	18·33	0·068	0·147	0·002	14·6	3·2
West Middlesex	18·20	0·016	0·147	0·000	14·3	3·2
Southwark and Vauxhall	18·53	0·056	0·166	0·001	14·8	3·2
Chelsea	18·52	0·089	0·145	0·001	15·0	3·3
Lambeth	18·80	0·072	0·147	0·002	15·0	3·3
Other Companies.						
Kent	28·04	0·008	0·243	0·000	20·8	6·0
New River	17·83	0·024	0·147	0·000	14·0	3·0
East London	18·39	0·028	0·154	0·001	14·3	3·5

Note.—The amount of oxygen required to oxidize the organic matter, nitrites, &c., is determined by a standard solution of permanganate of potash acting for three hours; and in the case of the metropolitan waters the quantity of organic matter is about eight times the amount of oxygen required by it.

The water was found to be clear and nearly colourless in all cases but the following, when it was more or less turbid—namely, in those of the Grand Junction and the Lambeth Companies. The average quantity of water supplied daily to the metropolis during the preceding month was, according to the returns of the water companies to the Association of Medical Officers of Health, 120,204,176 gallons; and the number of houses supplied was 503,832. This is at the rate of 35·8 gallons per head of the population daily. The last official return from Paris stated that the average daily supply per head of the population was 30·5 gallons; but this includes the water used for the public fountains, and for the ornamental waters in the Bois de Vincennes and the Bois de Boulogne.

HY. LETHEBY, M.B.

PATENT GAS COMPANY, LIMITED.

A General Meeting of the Shareholders of this Company was held at the City Terminus Hotel, Cannon Street, London, on Friday, Aug. 1—Mr. A. F. CUNINGHAM in the chair.

The SECRETARY (Mr. W. H. Beck) read the notice convening the meeting, after which the following report of the directors, with the accounts appended, was submitted.

The annexed accounts show the state of the company's affairs up to June 30, 1873.

In accordance with the general wishes of the shareholders expressed at the special meeting of the company held on the 30th of April last, Mr. A. F. Cuningham and Major Mackenzie were elected directors of this company, and at once took their seats at the board.

The following directors then resigned their seats—viz. Mr. Ogle, Mr. Begbie, Mr. Stephenson, and Mr. Price. The new board re-elected Mr. Stephenson and Mr. Price, and have much pleasure in reporting that these gentlemen accepted office.

The directors have to report that they have completed the works at Sydenham for the Crystal Palace District Gas Company, and those works are now in full operation. The works at the South Metropolitan Gas Company's station are approaching completion, and the directors hope that they also will very soon be in full operation.

The contract made with the Barnet Company, which at the time might have been considered a fair contract, has proved an onerous one for this company, and owing to the increased price of coal and wages there is no present prospect of the loss at which the company is now working this contract being reduced.

The engineer has still under consideration the plans for the erection of works at Manchester, which have been long delayed owing partly to the numerous engagements of the engineer and partly to causes which the directors do not think it is in the interests of the shareholders to mention at present.

A shareholder has intimated his intention of bringing the question of the directors remuneration before the meeting.

In accordance with the Articles of Association, two directors retire. The retiring directors are Major-General George Burn and Captain Henry M. Gilby, and, being eligible, they offer themselves for re-election.

The following report in reference to experiments made at the Crystal Palace District Gas Company's works was also laid before the meeting:—

To the Directors of the Patent Gas Company, Limited.

Gentlemen,—Having received permission from my directors, I beg to hand you, in accordance with your request, a condensed copy of my report to the directors of the Crystal Palace District Gas Company, on the results obtained from the first working of the Eveleigh process at Sydenham.

"Having now tried, on a thorough commercial scale, four descriptions of coal by means of this process, I now beg to submit the results of the working, which embraces 372 tons of coal with a production of 3,200,000 feet of gas.

Coal.	Product per Ton.	Illuminating Power.	Fuel used.
Old Silkstone. . .	8,815 cubic feet. . .	19·48 candles. . .	32·72 per cent.
Wigan gas coal . .	6,720 ,, ,, . .	17·86 ,, . .	45·00 ,,
Londonderry gas coal	8,764 ,, ,, . .	15·81 ,, . .	35·00 ,,
Norfolk silkstone .	10,087 ,, ,, . .	20·08 ,, . .	32·60 ,,

"I beg to add here, that the Wigan gas coal was quite a failure on the ordinary process, after using 300 tons as a trial.

"The average product per mouthpiece per 24 hours, extending over the whole of the experiments, is over 4000 feet, and while using 'Norfolk silkstone' it averaged over 5000 feet. Fuel used embraces the working of the stills. The product of oil per ton of coal used has averaged 25 gallons, and in order to obtain the most favourable results, it was distilled as fast as it was made; and although 372 tons of coal have been carbonized, the distillation has been so thoroughly destructive, that no residual tar or oil remains, only hard pitch, which has been produced at the rate of 112 lbs. per ton. of coal carbonized, and is of a very superior quality. With reference to ammoniacal liquor, the product is from 9 to 10 gallons per ton of coal, and it appears to be of the same specific gravity as by the ordinary process.

"The quantity of coke produced is at the rate of 36 bushels per ton, and is of a very good quality; superior to that obtained by the ordinary process, being hard and dense, and weighing from 14 to 15 cwts. per chaldron, depending upon the amount of moisture it contains. Purification has been effected by means of oxide of iron, and the cost on this head is not more than by the ordinary process. As might be anticipated from the low temperature of distillation, the amount of sulphur in 100 feet of gas is very small, say from 6 to 8 grains, and although an ordinary scrubber has been used, on no occasion has a trace of ammonia been found.

"The cost of labour for carbonizing has averaged 6d. per 1000 feet, which is not exceptionally large considering the scale upon which the gas has been made. I ought to add here, that the cost of working the stills is included in carbonizing.

"The, what might be aptly termed, 'Descension-pipes,' are not liable to 'pitch up' if care is taken to clear them out, say once a week. As regards the stills and connexions, in order to keep them clear a small jet of steam is necessary. The stoppages, however, are not of a serious nature, and are cleared out by the stoker in charge without difficulty.

"On the whole, the results from the use of Norfolk silkstone are all that the promotars of this system led us to expect—viz., a product of over 10,000 feet per ton, an illuminating power of over 20 candles, with a yield of 5000 feet per retort per 24 hours; and these results, gentlemen, have not been obtained by a laboratory experiment, but by the production of from 50,000 to 55,000 feet per day from 10 retorts, charged every 12 hours, and a fuel account of 32·60 per cent. of the coke made.

"I would just add that special care has been taken not to exaggerate the aforesaid figures, and interested parties might easily have made the results more favourable. My aim has simply been to carry out your instructions—viz., to obtain the true commercial value of the process."

I have not had time to investigate this matter further than as above stated, but I shall shortly be able to enter into the question of the relative cost of gas of high illuminating power, manufactured by the Eveleigh process, and that produced from cannel coal in the ordinary way. So soon as I have done so, I will report to you more fully.—I am, gentlemen, yours truly,

(Signed) JAMES WATSON,
Engineer and Manager, Crystal Palace District Gas Company.

Crystal Palace District Gas Company, Lower Sydenham, S.E., July 28, 1873.

Profit and Loss Account, from Feb. 28, 1872, to June 30, 1873.

Dr.		*Cr.*	
To Chemical, engineering, and other special services and expenses	£2,432 19 9	By Registration, &c., fees	£480 5 6
Engineer's department, including salaries of assistants, draughtsmen, &c.	601 17 10	Interest on deposits, &c.	574 16 0
Rent and taxes	760 15 2	Royalties	20 0 0
Office expenses, stationery, printing, advertising, &c.	592 7 5	Sale of patents account—balance transferred	2,773 17 10
Office salaries	846 5 6	Balances carried to balance-sheet	6,818 17 0
Law charges	555 10 0		
Auditors fees	42 0 0		
Travelling expenses	248 15 3		
Directors remuneration to Feb. 5, 1873	1,000 0 0		
Experimental department—Peckham and Barnet	301 15 10		
Loss on gas manufactured under contract at Barnet	2,596 5 4		
Income-tax	689 5 0		
	£10,667 17 1		£10,667 17 1

Sale of Patents Account.

To Reserve account for cost of certain rights in respect of American patent	£2,875 0 0	By sale of American patent—deposit paid, forfeitable in event of incompletion	£50,000 0 0
Dividend paid	44,351 2 2		
Balance carried to profit and loss account	2,773 17 10		
	£50,000 0 0		£50,000 0 0

Balance-Sheet, from Feb. 28, 1872, to June 30, 1873.

To Share capital, 60,000 shares of £5 each, consisting of—			By Payment to old company, as per contract dated Feb. 22, 1872, of 45,000 shares, £5 each, with £4 each credited thereon (3rd issue, as per contra)		£180,000 0 0
50,833 issued	£254,165 0 0		Payment for certain rights in respect of American patents, 833 shares, £5 each, with £4 each credited thereon (3rd issue, as per contra)	£3,332 0 0	
9,167 not issued	45,835 0 0		Less cash received thereon, as agreed	457 0 0	
	£300,000 0 0			2,875 0 0	
1st issue of 45,000 shares to old company, as per contra, on which there has been credited £4 per share	£180,000 0 0				£182,875 0 0
2nd issue of 5000 shares, on which £4 per share has been called up	£20,000 0 0		Expenditure in respect of British and foreign patents		422 12 3
Less arrears of calls still unpaid	1,312 0 0		Investment in Petersburg and Viborg Gas Company's shares		2,500 0 0
		£18,688 0 0	Office furniture and fixtures		149 17 6
3rd issue of 833 shares, on which there has been credited £4 per share, in payment for certain rights in respect to American patent, as per contra	3,332 0 0		Works—		
		183,332 0 0	Peckham	£702 19 5	
Cash balances and sundry assets brought forward from old company	£2,586 9 5		Barnet	3,375 9 3	
Less amounts refunded on account of old company for payments in excess	30 0 0		Ostend	112 1 3	
		2,556 9 5	Crystal Palace District Gas Company's station	374 15 5	
		£204,576 9 5	Paris	743 1 10	
Amounts owing to sundry creditors, June 30, 1873, on open account	£1,506 4 6		Vienna	662 14 8	
On dividends	35 3 0		Copenhagen	60 0 6	
		1,541 7 6	Spain	82 9 2	
Excess payments account		3 15 0			6,113 11 6
Reserve account—reserved from sale of patents account (see Sale of Patents Account)		2,875 0 0	Chemical apparatus—		
			Peckham	£26 1 6	
		£208,996 11 11	Barnet	225 9 7	
					251 11 1
Contingent liabilities—calls on Petersburg and Viborg Gas Company's shares, not yet made		£7,500 0 0	Furniture, testing-house, and works, Barnet		160 14 0
			Amounts owing by several gas companies and sundry debtors		2,503 18 8
			Stores, materials, and products on hand		474 19 11
			Cash balances at bank, and on deposit	£6,681 2 5	
			Dividend account	35 3 0	
			Petty cash balances	9 4 7	
					6,725 10 0
			Profit and Loss		6,818 17 0
					£208,996 11 11

The CHAIRMAN said: It will be in the recollection of most gentlemen present that at the last meeting the shareholders expressed a very strong wish that there should be a reconstruction of the board of the company. In accordance with that wish the directors held a meeting the next day, and elected Major Mackenzie and myself to seats at the board. Immediately afterwards four of the old directors retired—viz., Mr. Ogle, Mr. Begbie, Mr. Stephenson, and Mr. Price. Major Mackenzie is probably a stranger to most of you, but I had known him for years, and I felt assured that he would be a valuable colleague, which he has proved to be. We thought it was so important in the interests of the company that Mr. Stephenson should not retire, that we re-elected him to a seat at the board, and I am glad to say he accepted office again immediately. I must say, speaking as a shareholder, I felt that it was a good thing for the company, and augured well for our future success, that a man of his position, and knowledge, and intelligence should not only have identified himself in the first instance, but should, so to say, have re-identified himself with us. It showed, to my mind, that he thought there was something in the process which would ultimately prove of great value. We also re-elected Mr. Price. He is a large shareholder in the concern, and, in addition, he holds a large stake in, and is a director of, the Petersburg and Viborg Gas Company, in which we too are largely interested. I am happy to say that he accepted the seat to which we re-elected him. Referring to the next paragraph in the report, I may state that the apparatus at Sydenham is complete and in full working order. I think the report which Mr. Watson has made is very satisfactory, and there are one or two paragraphs in it to which I would draw particular attention. The first is that in which he says, "The quantity of coke produced is at the rate of 36 bushels per ton, and is of a very good quality; superior to that obtained by the ordinary process, being hard and dense, and weighing from 14 to 15 cwts. per chaldron, depending upon the amount of moisture it contains. Purification has been effected by means of oxide of iron, and the cost on this head is not more than by the ordinary

process. As might be anticipated from the low temperature of distillation, the amount of sulphur in 100 feet of gas is very small, say from 6 to 8 grains, and although an ordinary scrubber has been used, on no occasion has a trace of ammonia been found." That, I think, is very satisfactory. Then, again, he says, "The, what might be aptly termed, 'descension-pipes,' are not liable to 'pitch up' if care is taken to clear them out, say once a week. As regards the stills and connexions, in order to keep them clear a small jet of steam is necessary. The stoppages, however, are not of a serious nature, and are cleared out by the stoker in charge without difficulty." This was a difficulty we had at Barnet. The descension-pipes were continually choking, and we attributed it to the bad management there. He goes on to state that, "on the whole, the results from the use of Norfolk Silkstone are all that the promoters of this system led us to expect;" and having given these results, he concludes by remarking that "special care has been taken not to exaggerate the aforesaid figures, and interested parties might easily have made the results more favourable. My aim has simply been to carry out your instructions—viz., to obtain the true commercial value of the process." If you read carefully through the other paragraphs contained in the report, I think you will agree with me that they afford great encouragement to the shareholders in this concern, and prove that there is something in the patent gas process which will hereafter be turned to good account. The apparatus which is being constructed at the South Metropolitan Company's works is approaching completion, but is not yet in working order. Coming now to the contract with the Barnet Gas Company, I think I may say that a more unfortunate contract no company ever made with another. It was a bad contract from the beginning—a losing contract, and nothing can prevent our making a loss by it. However, we are bound hand and foot by it until November, 1874; we cannot get out of it, and therefore must make the best of it. The directors report tells you that "the engineer has still under consideration the plans for the erection of works at Manchester, which have been long delayed, owing partly to the numerous engagements of the engineer and partly to causes which the directors do not think it is in the interests of the shareholders to mention at present." Mr. Mellor is our engineer, and a very energetic man he is, but he has so many irons in the fire that he cannot give to our affairs all the time and attention we should like him to give. If he could, I think we might bring our business to a successful issue sooner, and I do trust he will see his way to expedite matters a little. Two of the directors now retire, and Mr. Mowatt gave notice at the last meeting to bring forward a motion respecting the remuneration of the board. It cannot be expected that directors will work for nothing, and I am sure the proposition has only to be submitted to the meeting to receive your assent. Now we go to the balance-sheet. This is the first occasion on which you have had a regular balance-sheet, and a regular statement of profit and loss, showing exactly how we stand in every respect. We look very large in these accounts in point of figures. Our nominal capital is £300,000, which sounds very grand. The capital paid up (*i.e.*, said to be paid up) is upwards of £200,000, but I may remind you that out of that large sum the company have only received £22,000; that is our actual capital, the other is in the air—it does not exist. The principal feature in the accounts is the amount received for the sale of the American patent, and while on that subject I may say that the time for payment of the second instalment expires on the 6th inst. We have written to the agent of the concessionaire to know whether it is intended to go on with the purchase or to allow it to lapse, but we have received no answer. However, time will soon solve the matter for us. You will see by the accounts that out of the £50,000 received the directors have paid the shareholders £44,000—a very large sum indeed—and it is that which has thrown our profit and loss account to the bad altogether. It seems inconsistent that the shareholders should have received £44,000, while the profit and loss shows £6850 to the bad. It would have been much better to divide a smaller sum, and then the profit and loss would have come out more satisfactorily. The different items speak for themselves, and I do not know that any of them calls for particular observation. The profit and loss account is made up from the beginning of the company. The first item is "Chemical, engineering, and other special services and expenses, £2432 19s. 9d;" of this sum £483 1s. 7d. has been incurred since Jan. 1. "Engineers department, including salaries of assistants, draughtsmen, &c., £601 17s. 10d.;" of this £184 12s. 6d. has been incurred since Jan. 1. "Rent and taxes, £760 15s. 2d.; office expenses, £592 7s. 5d.;" of this £171 only has been incurred this half year. "Office salaries, £846 5s. 6d.;" of this £318 has been incurred this half year. "Law charges, £555 10s.;" this half year they were £363. These law charges were principally incurred in the reconstruction of the company and expenses consequent on that. The auditors fees are £21 this half year. Travelling expenses, £248 15s. 3d.; of which only £25 belongs to this year. Directors remuneration to Feb. 5, voted at the meeting of that date, £1000. The experimental department is much less—£49 this half year, out of £301. Loss on gas manufactured under contract at Barnet, £2596, of which £1125 belongs to this half year. It is rather a large proportion, but it is accounted for by the increased price of coal and wages, and the increased quantity of gas, the make having doubled since we began. Income-tax was not paid at that time, but now we shall have to pay it, and therefore it is better to bring it into the profit and loss account. We now go to the other side of the account. Registration fees, &c., £480, of which £90 belongs to this half year, showing the difference in the jobbing of shares this last half year to the previous half. Interest on deposits, £574 16s., of which £217 is for this half year. Royalties, £20, is the same. On the contra side of the balance-sheet there is the payment to the old company of £180,000. There was no £180,000 passed at all; they were given 45,000 shares, on which £4 a share was credited. Then there is an item of £3332, payments for certain rights in respect of American patents. It appears that Dr. Eveleigh had come under certain engagements with other parties in America, and this company had to buy out the American claim before we could sell it, and that was the arrangement. "Expenditure in respect of British and foreign patents, £422 12s. 3d." These are sums we have been obliged to expend in order to preserve our rights in foreign parts. "Investment in Petersburg and Viborg shares, £2500." You will see by a note at the bottom we are liable for £7500 more. Mr. Price is a director of that company, and he can answer any questions if you wish for information on that subject. "Office furniture and fixtures, £149." "Works at Peckham, £702 19s. 5d." Nearly the whole of that was incurred before Jan 1. At Barnet we have expended altogether £3335, of which £432 was since the 1st of January. I am afraid, in order to complete these works, we shall have to expend some £300 or £400 more. It is a bad bargain, but we cannot help ourselves. At Ostend we have spent £112. At the Crystal Palace District Company's station, £374. The nature of our agreement with them is this—we have agreed to put up works there and they are to pay us £600; all expense beyond that we are to pay out of our own pockets. They have paid the £600 and this is the surplus. At Paris we had to expend £743 1s. 10d., of which £49 only was since the 1st of January. At Vienna we have spent £662; that is all incurred since the 1st of January, to show off our patent process there, and attract attention and let it be known throughout the Continent, and at the same time maintain our patent rights there. At Copenhagen £60 has been spent this year, and in Spain £82. "Chemical apparatus at Peckham, £26; at Barnet, £225;" all but £5 of that was incurred before the 1st of January. "Furniture, testing-house, &c., £160; amounts owing by several gas companies and debtors, £2503; stores, materials, and products on hand, £474; cash balance at bank and in hand, £6690; and dividend account, £35." These are all the various items. I think we have put the case plainly before you, and if there is anything I have not thoroughly explained, I shall be happy to answer any question. In the meantime, I move that the report be adopted.

Major MACKENZIE seconded the motion.

Mr. TAYLOR: I do not know the nature of the contract which exists with the Barnet Company. I assume you have undertaken to find them in coal?

The CHAIRMAN: Yes.

Mr. TAYLOR: It was rather amusing to hear you talk about paying "too great a dividend" out of the American money. We believe that that affair was altogether a trick—a sort of "hocus-pocus" to enable parties to sell shares at a premium.

The CHAIRMAN: I do not know whether it was a trick or not. The company, at all events, got the 50,000 sovereigns.

Mr. TAYLOR: But if the persons who had the shares pretty nearly free sold them, as no doubt they did, at a high premium, that may be the explanation of the whole transaction.

Another SHAREHOLDER: Is it worth discussing this subject at every meeting we come to?

Mr. TAYLOR: I never was at one of these meetings before, and I want to know whether the chairman is cognizant of these proceedings. He seemed to speak of the payment of the money as a delusion and a trick, and I want to know whether we may not get into a muddle with these American contractors—whether they may not turn round upon us?

The CHAIRMAN: Nothing of the sort. We simply sell them the right to use our patent in America for £250,000, of which sum we have received £50,000.

Mr. HENWOOD: As to our liabilities in connexion with the Petersburg shares, I should like to know how we stand.

The CHAIRMAN: The shares are not yet fully paid up, and we are liable for the calls.

Mr. HENWOOD: Is there any chance of the calls being made?

Mr. PRICE: I think I may say that we anticipate the shares will be called up as it is intended to carry on the company. We have only been waiting to get an extension of time, and this morning we received a telegram stating that the extension of 18 months longer time had just been signed.

Mr. MORRISON: I apprehend the object in taking the shares was to secure a very substantial customer. I understand we shall receive £1000 a year from that company when it is in operation, and a further amount if the limits are extended beyond the original intention; so that it is not the worst bargain we have made.

Mr. MELLOR: We have a positive contract with them to use our process, for which they are to pay 3d. per 1000 cubic feet.

The CHAIRMAN (in reply to an inquiry) said the arrangement with the Crystal Palace District Company was that they were to pay £600 towards the erection of the necessary works for practically trying the system. Any further expense was to be borne by the Patent Gas Company.

Mr. H. P. STEPHENSON said the Crystal Palace Gas Company were to pay a royalty of £9 per retort per annum.

The SECRETARY: £6.

Mr. STEPHENSON said he was deputy-chairman of the company, and his strong impression was that the royalty was £9. The company had erected 10 retorts on the Eveleigh principle, and were now experimenting upon the whole.

A SHAREHOLDER asked whether the report made by Mr. Watson was of such a character that the directors of that company would be likely to adopt the process entirely.

Mr. STEPHENSON said he would rather not pledge himself to anything in the future that he could not see his way to. At present the directors had come to no resolution in reference to the report of their manager. As a member of the board of the Patent Gas Company he did not wish to mislead the shareholders. There had been so much speculation in the concern that, though he had a certain amount of confidence in the undertaking, he felt that he must speak with extreme caution. He believed that the system was being tried fairly and thoroughly, and he could honestly say that whether the results obtained were good, bad, or indifferent, those results should be placed before the shareholders.

The CHAIRMAN said one thing to be decided at Sydenham was the commercial value of the process—whether it would pay. It might produce certain results as testified by Mr. Watson, but those results might be secured at such a price that it would not pay commercially to adopt the process. The experiments had not as yet been continued a sufficiently long time to determine that point.

Mr. HENWOOD: What is the probability of a further call in this company?

The CHAIRMAN: There is no probability at present that I know of.

Mr. HENWOOD: We have liabilities amounting to upwards of £7000, and assets only £6000, and a prospect of further calls on our shares in the Petersburg Company.

Mr. PRICE: Not at present.

Mr. STEPHENSON remarked that Mr. Price had not led them to suppose that the whole liability of £7500 would become due at once.

Mr. HENWOOD said the question to his mind was how long this company could go on without a call, looking to the fact that they were losing £1100 or £1200 a year at Barnet, with the prospect, as he supposed, of an increasing loss under that contract.

Mr. STEPHENSON said whether the loss on the working at Barnet would increase depended upon the future price of coal.

Mr. MORRISON asked whether negotiations were going on for the adoption of the process in other places.

The CHAIRMAN said the board had received no applications on the subject. He did not know whether the engineer had.

Mr. HENWOOD said he had made inquiries at Manchester and found that no progress whatever had been made in that city. The corporation were carrying on their manufacture on the ordinary system.

The CHAIRMAN said there was no use in the directors entering into fresh arrangements until they felt their way. The Sydenham arrangement was the first chance they had of testing the goodness of their system, and it was better to wait for the results of those experiments than to rush blindfold into other negotiations, ending, perhaps, in another Barnet contract.

Mr. COCHRAN said he should like to be informed what was the amount of cash received by this company from the Barnet Company.

A SHAREHOLDER: The simplest way would be to state the assumed loss per annum.

Mr. STEPHENSON: It has been over £1100 in the half year.

The CHAIRMAN said he did not know what the last speaker's object was in asking the question, but he thought it right to tell the meeting that Mr. Cochran was interested in another patent, which was an attempt to oust this company out of their rights, and, therefore, he might be asking this question from interested motives.

Mr. COCHRAN said he was a shareholder in the Patent Gas Company, and he stood there merely for the purpose of getting information.

Mr. MAITLAND: Can the chairman put it in this way? Can he give us this information—it never has been explained to these meetings, and I know it is capable of a satisfactory explanation—if such an arrangement had been made with the Barnet Company, by which we should have received a fair price for the gas manufactured according to the rise in the price of coal, whether these figures would not materially have turned on the other side?

The CHAIRMAN: Unfortunately the bargain with the Barnet Company is made.

Mr. MAITLAND: But suppose another bargain had to be made?

The CHAIRMAN: That is a hypothetical case.

Mr. MAITLAND: We know this, that the directors justified that bargain, though a very bad one commercially, as giving the opportunity to demonstrate the value of the system. Well, if the worst comes to the worst, we shall only lose £2000 or £3000 more, and then we shall get out of it. But supposing we had made a fair bargain, allowing for the increased price of coals, what advantage would there have been beyond?

The CHAIRMAN: That is a question of figures which I cannot go into now.

Mr. MAITLAND: I believe the contract we have is to manufacture for them at 2s. per 1000 cubic feet?

Mr. STEPHENSON: A large portion at 1s. 4d.

Mr. MAITLAND: And they are selling it at 5s. 6d., and are putting the difference into their own pockets?

The CHAIRMAN: They are selling it at 6s.

Mr. MAITLAND: And are purchasing at 1s. 8d. upon the average; so that if we had had a fair price, there would have been an ample margin of profit for both parties. I believe we are manufacturing gas at a much cheaper rate, allowing for the price of coal, than any other company.

Another SHAREHOLDER: Are we obliged, under our contract with the Barnet Company, to manufacture any particular quantity?

The CHAIRMAN: Yes, all that they require.

Mr. COCHRAN: I again ask for information as to the amount of cash received by this company from the East Barnet Company from Feb. 6, 1872, to the 30th of June last.

The CHAIRMAN: £2698 10s. for the whole period.

Mr. COCHRAN: I see that the products of this company on hand are put down at £474. Of what do they consist?

Mr. STEPHENSON: Pitch, tar, coke, oils, &c. Everything on the works.

Mr. COCHRAN: Where is the money accounted for, for oil sent away from the works?

The CHAIRMAN: It is all included in the accounts.

A SHAREHOLDER: These are matters of detail which cannot be gone into here.

The CHAIRMAN: I leave it to the meeting to say whether they wish these particulars gone into.

Mr. STEPHENSON: I think I explained this fully at the last meeting. I was not a director of the company when this unfortunate contract was made; but you must remember that the then directors, and I suppose no one else in the United Kingdom, in any way anticipated the very large rise which has taken place in the price of coal. No doubt a very large portion of the loss on that contract is due to the extraordinary position of the coal market, and, therefore, you must not throw the whole of the blame upon the original directors for entering into that contract. The question has been put to us what is the reason we do not get such good results at Barnet as Mr. Watson is now getting at Sydenham. That I fully explained at the last meeting. The Patent Gas Company were bound to erect the retorts and apparatus connected therewith; the Barnet Company ought, but did not, supply the rest of the apparatus. A large district has been added to their original district, a large increase has taken place in the supply of gas, and they are not and have not been providing the apparatus necessary and desirable for that increase. The purifiers, engines, exhausters, and meters are too small—all the apparatus generally is far too small for the present works, and it was fully explained at the last meeting that these were the reasons why we were not working properly at Barnet; and I cannot conceive, under the circumstances, how we can expect good results there. We have no clause which legally compels the Barnet Company to increase the size of the apparatus in their power. They are gradually and voluntarily doing it, but not sufficiently quick to meet our requirements. We are, consequently, not working so well in our fuel or labour account, nor in our purification, as we ought.

Mr. COCHRAN: I know that in East Barnet, instead of getting 20-candle gas, we are only getting 7 candle. If we could get 10 candles, we should be perfectly satisfied.

Mr. STEPHENSON: That arises in part from the retorts erected by your partner in your new patent. You know that your partner erected new retorts at Barnet which have not answered well.

A SHAREHOLDER: Is it possible to get rid of this unlucky Barnet contract on any terms?

The CHAIRMAN: I am afraid not, until November, 1874. We are bound hand and foot to them.

Another SHAREHOLDER: I have heard it suggested that the reason why this company does not answer, and our shares are at such a discount, is, that the gas made furs up the pipes and could never be made to work well. I do not say that it is so; but if you could give us an assurance on the subject we could deny the statement.

Mr. MELLOR that question was most thoroughly settled by the report of Messrs. Keates and Odling, and our experience since has confirmed their testimony. There is no furring, there is no condensation; the gas carries as well as any other gas in the world.

The SHAREHOLDER: Was it stated in that report that it was likely the patent gas process would ever supersede the old system?

Mr. MELLOR: No.

A SHAREHOLDER: There are two parties to every contract. I understand Mr. Stephenson to say that the Barnet Company have failed to carry out their part.

Mr. STEPHENSON: I say they ought to have provided the apparatus. I do not think they are legally liable; but I think they ought to have done it.

The SHAREHOLDER: It is a most important question.

The CHAIRMAN: It is a most important question, and it has been looked into by the directors.

A SHAREHOLDER: Do we get any interest on our investment in the Petersburg shares?

The CHAIRMAN: Yes; 5 per cent.

The motion for the adoption of the report was then put and carried, with one dissentient.

Mr. MOWATT then, in accordance with the notice he had given, brought forward the question of the remuneration of the directors, and having expressed an opinion as to the efficiency of the board as at present constituted, he moved that the remuneration of the directors be £1000 a year, to take effect from the 5th of February last.

Mr. NEWTON seconded the motion, which was put and carried.

Mr. OGLE (late chairman of the company) said many of the shareholders would like to know the opinion of the board and of the officers of the company upon the report which had emanated from the manager of the Crystal Palace District Gas Company.

The CHAIRMAN said he did not know whether Mr. Ogle was in the room at the time he moved the adoption of the directors report, and when he commented upon Mr. Watson's report also.

Mr. OGLE said he would like to hear the opinion of the professional advisers of the board.

The CHAIRMAN said Mr. H. P. Stephenson also commented upon it.

Mr. MOWATT remarked that Mr. Stephenson, being also the deputy-chairman of the Crystal Palace Gas Company, might, perhaps, not feel so free to give an opinion.

Mr. STEPHENSON said he was asked whether the latter company would pledge themselves to the patent gas process *in toto*.

Mr. OGLE said the time would come when, in his double capacity, Mr. Stephenson would have to act fairly between the two companies, and an offer would have to be made as to the mode in which the thing should be carried out.

Mr. STEPHENSON: No; we have made our bargain already for the future, and we are to use the patent to any extent we think fit, paying the royalty agreed upon.

The CHAIRMAN: Mr. Ogle must be as cognizant of the matter as Mr. Stephenson is, as he was a member of the board at the time the bargain was made.

Mr. OGLE: If your engineer would give his opinion as to the nature of that report it would be valuable.

Mr. NEWTON: I quite approve of that suggestion, for I have heard very divergent views expressed as to the nature of Mr. Watson's report.

Mr. MELLOR: I only got the report yesterday morning, and I read it with very great pleasure indeed, inasmuch as it confirms every word I have said to the shareholders as to the quantity and quality of the gas which this system will produce. I am quite sure that no one will charge me with having budged one inch from my position in this matter. Unfortunately, I feel that I deserve the comments made upon me by the chairman for not being able to devote that time to your patent which it richly deserves; but I am only a professional man earning my living by my own exertions, and I cannot afford to devote my time to you for nothing. I have been obliged to look to other matters more immediately remunerative, but I have never for one moment budged from my position that your patent is a valuable one. It requires time to develope it, and an engineer to devote his whole time to it. You could not afford to give me what I should require, and I felt it my duty to place my resignation in the hands of the directors—but they did not accept it—simply because I have not the time to devote to your affairs. But, with regard to this report, I look upon it as confirming every statement which the previous directors and the present ever held out. At the Crystal Palace District Gas-Works we have as fair an opportunity as any we shall get for ascertaining the facts; but at Barnet, unfortunately, we have been all along saddled with the most extraordinary difficulties. We have only to look forward to the completion of the experiments at Sydenham, and then I believe the gas companies of England will be glad to adopt us.

Mr. NEWTON: In the report of Mr. Watson is there nothing to lead you to a conclusion as to the commercial value of our patent? It seems to me, in my uneducated mind, that we get a number of facts as to certain coals producing a certain quantity of gas and other products; but is there anything in the report which would make it difficult to explain to an unscientific mind what the actual practical value of the process is?

Mr. MELLOR: There are four facts brought out by the report. First, that by this process we get more than 10,000 cubic feet of gas per ton of coal; second, that the gas produced has an illuminating power of over 20 candles; third, that it contains very little sulphur; and, fourth, that all this is done with a consumption of 32 per cent. of fuel. There is also, I see, a fifth fact—viz., that the labour costs only about 6d. per 1000 cubic feet. Now 6d. is not much higher than the cost of labour in ordinary gas-works, especially when you take into consideration that there are here only ten retorts; and that the ammoniacal liquor is as good as we have always considered it. Add these things together, and take the relative local position of gas-works, and you have the question answered.

Mr. NEWTON: The chairman gave us to understand that we had not yet come to a knowledge of the commercial value of our patent, and I addressed my remarks to you to ascertain whether there was anything still to be calculated which this report has not gone into.

Mr. MELLOR: Mr. Watson says—and I think that is what the chairman referred to—"I have not had time to investigate this matter further than as above stated, but I shall shortly be able to enter into the question of the relative cost of gas of high illuminating power, manufactured by the Eveleigh process, and that produced from cannel coal in the ordinary way. So soon as I have done so, I will report to you more fully." This question Mr. Watson will work out. I have already expressed my opinion upon it.

Mr. NEWTON: According to your view, Mr. Watson has not yet determined the question of cost?

Mr. MELLOR: Not in that way.

The CHAIRMAN: It is a question of time.

Mr. MELLOR: Since the apparatus was erected at Sydenham I have felt it my duty not to go near those works.

Mr. MORRISON: What results do you think might fairly be relied upon in using Norfolk silkstone coal, by the ordinary process. If you could tell us this we could, by comparison with what is done in the ordinary way, form our own conclusions.

Mr. MELLOR: I think we might safely say we should obtain 9500 cubic feet of 15 candle gas, with an expenditure of 25 per cent. of fuel and the same cost for labour; the amount of sulphur being from 15 to 30 grains according to the heat at which the coal is distilled.

A SHAREHOLDER: When I first attended these meetings I was told that several companies wanted to have our patent. Now it appears that none will have anything to do with it except the Barnet and Crystal Palace District companies. In fact, there never was a company in a worse position than ours. I feel sure you will have to make another call upon the shares, and then in six months time we shall be wound up. Your expenses for salaries of officers amount to nearly £1500 a year; the meeting has just voted £1000 a year to the directors, so that there is a dead loss of £2500 a year. I think we had better wind up at once.

The CHAIRMAN: You, sir, seem to be quite of the Cassandra type. Are you at all aware what bringing out a patent is? I think the Bessemer process cost £80,000, without one penny being received.

Mr. OGLE: And twelve months before Bessemer was receiving £50,000 a year, an offer was made of one-third of the patent for £1000.

The next business was the re-election of the two retiring directors, and Mr. MORRISON moved the re-election of Captain Gilby, but on a show of hands the motion was negatived by a large majority. The feeling of the meeting having been thus expressed in favour of reducing the board, Major-General Burn, the other retiring director, withdrew his offer as a candidate. The board therefore consists of four members only—viz., Mr. Cuningham, the chairman, Major Mackenzie, Mr. H. P. Stephenson, and Mr. Price.

Mr. MORRISON said the £1000 a year as remuneration to the directors had been fixed under the impression that the board would consist of six members, and he should therefore propose that the resolution be rescinded, and the remuneration fixed at £600 a year.

The CHAIRMAN said he was advised by the solicitor that he could not put such a resolution at the present meeting.

On the motion for the re-election of auditors,

A SHAREHOLDER called attention to the form of certificate appended to the accounts, which he insisted gave no guarantee whatever to the shareholders. It was in these words: "We have examined the books of the company with the vouchers, and have ascertained that the above accounts correctly represent the position of the company, as shown in the books."

Mr. WADDELL, one of the auditors, said it was a very usual form of certifi-

cate, and had been introduced by the firm of Coleman, Turquand, and Co. It was impossible for the auditors to know anything beyond what appeared in the books.

Upon the motion of Mr. STRATTON, seconded by Mr. OGLE, Messrs. J. Waddell and Co., public accountants, were then re-elected auditors, with a fee of 20 guineas.

A vote of thanks was given to the two directors who had retired from the board, also to the remaining directors and to the chairman, and the proceedings terminated.

BRITISH ASSOCIATION OF GAS MANAGERS.

The following papers would have been read during the recent sittings had time allowed. They are published with the approval of the authors, and will appear in the Transactions of the Association :—

LAIDLAW'S COMBINED SELF-ACTING BYE-PASS AND COMPENSATOR.

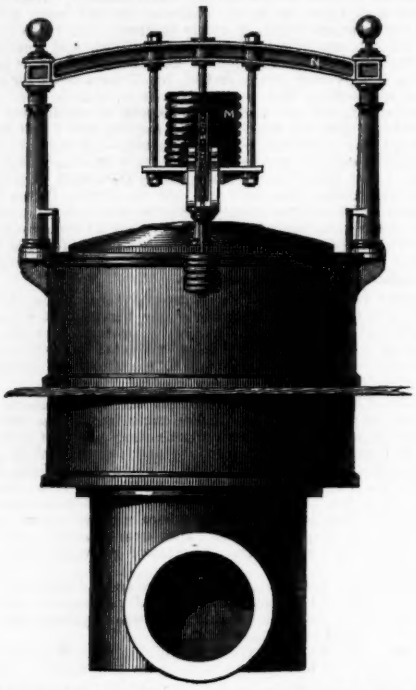
The exhauster having come into very general use not only in large and extensive gas-works, but also in works of comparatively limited extent, it has become a matter of considerable importance to have a simple and effective machine to regulate and modify its action, and so maintain a steady and uniform degree of pressure or vacuum on the hydraulic main and other apparatus.

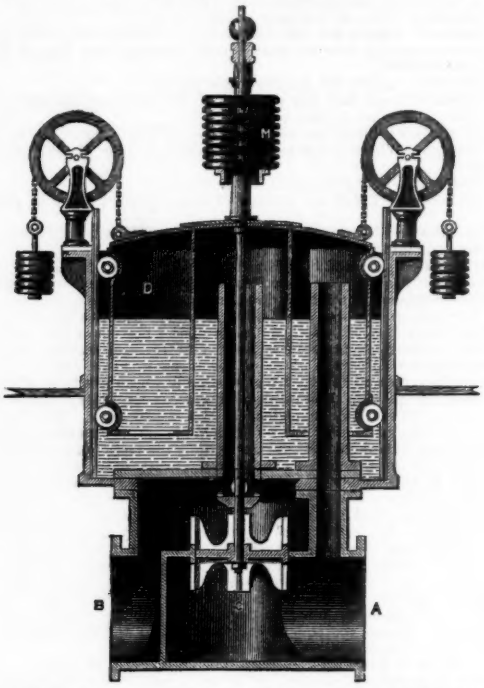
Amongst the numerous and varied contrivances that have hitherto been proposed for this purpose, the majority have aimed at accomplishing this through the medium of the throttle-valve, expansion-valve, or governor of the engine; these being attached by suitable mechanism to a bell or small gas-holder, which, being acted on by the vacuum created by the exhauster, regulates and controls the speed of the engine to suit the quantity of gas being produced. These arrangements are all more or less effective, but are not always sufficiently quick and sensitive in their action to prevent considerable variations in the pressure.

In many cases, also, especially in the smaller-sized works, where power is required for other purposes, such as driving pumps, &c., it is undesirable to vary the speed of the engine to any great extent, in which case a compensator is adopted.

In neither of the above arrangements, however, is any provision made for a sudden stoppage of the exhauster through any derangement of the engine, or other causes, this having to be provided for by a separate bye-pass valve.

In the machine which I now propose to bring under your notice, an illustration of which is hanging on the wall, the compensator and self-acting bye-pass valve are combined in a simple and efficient manner. Its action will be easily understood by reference to the drawing.





The machine may be placed in any convenient position, and the flanged branches A and B connected to the vacuum and pressure sides of the exhauster, A being attached to the suction, and B to the delivery side. The valve C is a flat disc, with prongs cast on each side, that act as guides when the valve works up and down in the bored-out seat to which it is fitted. This valve is attached to the bell or small holder D by a rod F, so that when the bell is moved upwards or downwards by the action of the exhauster the valve has a corresponding motion, and opens or shuts accordingly.

The bell is suspended by chains passing over pulleys, to which are attached weights sufficient to counterbalance the weight of the bell with the rod and valve attached to it. In some cases a beam with back balance-weights is used, and in the smaller-sized machines an air vessel or float is by preference adopted for the purpose. Thus, by increasing or decreasing the balance-weights, any required degree of pressure or vacuum can be readily obtained.

The weights, marked M, suspended from the cross-beam, through which the guide-spindle passes, are in a state of rest when the machine is acting as a compensator, and are not intended to come into operation until it is required to act as a bye-pass valve. The number of these weights varies according to the pressure in the works, in no case exceeding, but being rather under, the general pressure. Each weight may be taken to represent an inch of pressure. The action of the machine, it will thus be seen, is very simple. When the speed of the exhauster is greater than is required for the make of gas at the time, a slight vacuum is produced, which, acting through the pipe E on the crown of the holder D, draws it down, the valve at the same time being opened by the rod F, allowing the gas to return back from the pressure side through the valve in the direction of the letters B C A, thus restoring the pressure and shutting the valve, the weights M acting as a stop to prevent the valve from rising too far and opening on the opposite side.

On the other hand, should the exhauster stop from any cause whatever, the pressure immediately rises in the hydraulic main to the general pressure in the works, and this acting again through the pipe E, on the crown of the bell, presses it up against the weights M, and raises them, and at the same time opens the valve on the bottom side the necessary amount, allowing the gas to pass freely through in the direction A C B. It thus forms a perfectly self-acting bye-pass, without adding any additional pressure to the gas whatever. When the exhauster has again started, the weights acting on the bell press it down, and shut the valve, forming the necessary abutment between the inlet and outlet sides. The weights again rest on the cross-beam N, and the machine begins to act as a compensator as before.

It may be further observed that, as the valve C is, as a rule, made of the same diameter as the exhauster connexions, it has only to travel a very short space to give a large and sufficient opening for the gas to pass on either side, thus preventing any under vibration of the bell, or disturbance of the water in the lute. The pressure on the top side of the valve C is exactly counterbalanced by the pressure acting through the pipe F on the circular space of the crown of the bell, which in all cases is made the same area as the valve, and preserves it in perfect equilibrium, and as the friction is almost nothing, and there being no stuffing-boxes or spindles to set fast or get out of order in any way, the action of the machine is exceedingly sensitive, so that the slightest variation in pressure acting on the annular crown D of the bell, which is of large area, has at once the desired effect.

This machine, therefore, possesses the advantage of combining the two very important functions of compensator and bye-pass; it is very simple and strong in construction; is not liable to get deranged; is very sensitive and uniform in its action; and is thoroughly self-acting, requiring no attention from any one, either at stopping or starting. It is, in fact, a perfect *exhauster safety-valve*, and is consequently peculiarly fitted for works where close attention cannot be given to the exhauster-room. It is also specially adapted, from its great steadiness of action, for working along with any kind of exhauster, where the flow of gas is irregular at different portions of the revolution, and where consequently the pressure-gauge is unsteady.

These results are not founded upon mere theory, but are based upon an experience of the practical working of the machines, sufficiently long to justify the statements I have had the honour to lay before the members of this association.

NOTES ON THE METHOD OF CALCULATING THE FLOW OF GAS THROUGH PIPES.

By Mr. J. PATERSON, of Warrington.

The committee last year placed upon the paper of subjects recommended for the consideration of members, amongst others, "The best Method of Calculating the Flow of Gas through Pipes." I have, at the request of a few friends, and without presuming to lay claim to a profound knowledge of the subject, ventured, on behalf of younger members of the profession, to add a few brief notes thereon.

It is difficult to over-estimate the importance of an accurate knowledge of the flow of gas through mains, which, in the hands of a gas engineer, is an element of constant application. To apprehend and formulate the laws carried on by natural forces, he must adopt tentative methods by collecting data, some of which are constant, others variable. The gravity and weight of the atmosphere are constants, whose value has been long established. The pressure on the flowing gas, the length of pipe, the diameter of the same, its inclination with regard to the level and interior smoothness, and the specific gravity of the gas, are all variables, the value of which has to be found by experiment. The specific gravity of the gas and the pressure applied are important factors, and any error in one or other of these will materially affect the results. The physical laws which govern these calculations early attracted the attention of engineers, and after the experience of half a century it can hardly be said they are yet perfectly understood. The first investigator of the motion of gas in pipes appears to be M. Girard, a French engineer, who, in 1821, conducted a series of observations on tubes about half an inch diameter under different lengths and pressures, the results of which, though interesting, were of little practical value. In 1827, D'Aubuisson conducted a more important series of experiments on the quantities discharged through tubes of 2 inches diameter under various lengths and pressures, and of different specific gravities, from which he constructed a formula as applicable to the discharge of gas under different densities and diameters of cast-iron mains. The calculations of this engineer being founded upon the flow of gas through short tubes constructed of tin-plate, induced him to overlook the delicate but important principle of the loss of pressure by friction. The analysis of D'Aubuisson's laws may be briefly stated as follows, viz.:—

1. The discharge of gases under different degrees of density, when actuated by the same pressure, will be inversely as the square roots of their specific gravities.

2. The discharge through different sizes of pipes with gas of a uniform density, and actuated by a uniform pressure, is equal to the squares of their diameters.

To these the law of *friction* was added by Mr. Clegg, and published with D'Aubuisson's formula in the first edition of his Treatise in 1841. From a series of carefully conducted experiments, he found that the velocity of the gas varied in definite proportions with the length of the main, from which he deduced the following law, viz.:—That the quantities of gas discharged in equal times under the same pressure and for different lengths of main are to one another in the inverse ratio of the square roots of their lengths. Such was the state of this branch of physics up to the publication of Clegg's work. At that time the experiments had uniformly been conducted on pipes of comparatively small diameter, and the accuracy of the rules, as applied thereto, the writer had an opportunity of verifying in 1849, by operating on a 2-inch main 100 yards long; the gas, of a specific gravity ·365, was measured through a meter at the entrance to the main under an initial outlet pressure of 1 inch, and the discharge per hour was 1030 cubic feet. Thus, practically confirming the accuracy of the rules as applied to small mains, the measured and calculated discharges being equal, but as yet there was no proof of their applicability in the case of large mains.

In 1850, Mr. George Anderson, who was preparing plans for the erection of the Great Central works, was led to direct his attention to the delivery of gas through mains of large diameters, and he was the first to call attention, in an article contributed to the *Mechanics Magazine*, to the fallacy of the existing rules as applied thereto. The arguments are too long to be inserted here, but they may be resolved into the following abstract:—A 6-inch main of a given length and pressure is found to deliver per hour 4500 cubic feet; a 12-inch main, having four times the area of a 6-inch, is said to deliver 4500 × 4 = 18,000 feet; but as a pipe 6 inches in diameter is in circumference 18·8496 inches, four such pipes will be equal to 75·398 inches, while a pipe of 12 inches diameter has a circumference of only 37·7 inches. The rubbing surface is therefore in the proportion of 1 to 2, and in order to correct the error he proposed to multiply the result by the square root of 75, and divide by the square root of 38. In other words, he added the fourth law—viz., that under a given pressure, specific gravity, and length of main, the discharge will be in the inverse ratio of the square root of the rubbing surface.

In 1852, Professor W. Pole contributed to the JOURNAL OF GAS LIGHTING an article of great value on the laws which govern the flow of gas through pipes, in which the foregoing rules were adopted. This paper has been republished in the subsequent editions of Clegg, and may be studied by gas and water engineers with much advantage, possessing as it does probably all that is known and reliable on the subject at the present day. The learned professor puts the equation in the algebraical form thus:—

$$Q = 1350\, d^2 \sqrt{\frac{h\,d}{s\,l}}$$

Q = quantity of gas in cubic feet per hour.
l = length of pipe in yards.
d = diameter of pipe in inches.
h = pressure in inches of water.
s = specific gravity of gas, atmospheric air as 1.

In which it will be observed the radical sign of the square root covers both the numerator and denominator; the meaning of which is, that in the *first* term the diameter of the pipe is to be multiplied by the pressure both in inches. That in the *second* term the diameter in inches is to be added to the length of the main in yards, multiplied by the specific gravity of the gas; the product is then to be divided by the results of the first term, and the square root of the quotient extracted. That in the *third* term the square root of the diameter of the pipe in inches is to be multiplied by the constant 1350, and divided by the result of the second term, when the quotient will be the quantity discharged in cubic feet per hour. It is not to be assumed, however, that the application of these rules will in all cases be mathematically correct. There are disturbing causes, such as the unequal roughness on the interior surface of the mains, and their perfect or imperfect jointing, which necessarily exercises an important influence on the *coefficient*, an element which theory affords us no assistance in determining. From an extensive series of experiments on the discharge through long pipes, conducted in 1867 under the superintendence of M. Arson, engineer for the Paris Gas Company, we find this element varying in a remarkable degree from the results of previous experiments made in this country. In small mains the friction under those experiments appears to be greatly increased, while, on the contrary, for large mains it appears to be greatly diminished. Without entering into particulars or in any way detracting from the importance and consideration such a series of experiments deserve, I cannot help thinking that, allowing for any irregularities in the jointing of small mains, or of exceptional smoothness in the internal surfaces of large ones, there should not be a difference so decided as that found in the coefficients resulting from these observations, and it might be desirable to wait their confirmation by further evidence before committing ourselves to the alteration of the constant already established. At the same time I do not wish it to be understood that I consider the formula acknowledged amongst us as not susceptible of further improvement. The advancing tide of science may place at our disposal the elements of a higher and more perfect practice, and as theory is deduced from the results of generalized practice, it is not improbable it may be elevated to a more pure and accurate form. There is still a paucity of observations amongst English and Scotch engineers on this interesting subject, and when opportunities present themselves it would be desirable, in the interests of science, to record the results of their experience. As a small contribution to received experiments on comparatively large mains, I give the results of some careful observations I had the opportunity of making last summer on the discharge through a 16-inch main under the following conditions, viz:—

Length of main 280 yards, containing four sweep-bends at an angle of 90°.

Height of the termination of the main above the exit from the governor, 17 feet 9 inches.

Pressure measured on the exit-pipe from the governor, 1 inch and ½ inch respectively.

Specific gravity of the gas, 0·556 (air as 1).

The first of these observations, conducted under a pressure of 1 inch, indicated a discharge equal to 111,930 cubic feet per hour, and in the second case, under a pressure of 5-10ths, the discharge was 78,800 cubic feet.

If we apply the above conditions to the received formula—

$$Q = 1350\, d^2 \sqrt{\frac{h\,d}{s\,l}},$$

the calculated discharge does not differ very materially from the absolute results. Thus, let Q = 1350 cubic feet per hour.
l = length of pipe in yards, 280.
d = diameter of pipe in inches, 16.
h = pressure in inches of water, 1.
s = specific gravity of gas 0·556 (air as 1).

Then— . . . . . Log. 16 = 1·2041200
Log. ·556 = $\bar{1}$·7450748
,, 280 = 2·4471580 = 2·1922328
$2\overline{)}\bar{1}\cdot0118872$
$\bar{1}\cdot5059436$
Log. 16 × 2 = 2·4082400
,, 1350 = 3·1303338
Q = cubic feet per hour, 110,794 = 5·0445174

The calculated discharge under a half-inch pressure gives also a close approximation to the results of experiment, thus . . Log. 16 = 1·2041200
Log. 2 = 0·3010300
,, ·556 = $\bar{1}$·7450748
,, 280 = 2·4471580 = 2·4932628
$2\overline{)}2\cdot7108572$
$\bar{1}\cdot3554286$
Log. 16 × 2 = 2·4082400
,, 1350 = 3·1303338
Q = cubic feet per hour, 78,347 = 4·8940024

These observations seem to confirm the general accuracy of the value of the coefficient as received amongst us, the small difference being virtually removed by correction for elevation.

If it is desired to know what the discharge would be under a pressure of, say, three quarters of an inch—

Then, as before, Log. 16 = 1·2041200
,, ¾ = 0·4771213
1·6812413
Log. 4 = 0·6020600
,, ·556 = $\bar{1}$·7450748
,, 280 = 2·4471580 = 2·7942928
$2\overline{)}2\cdot8869485$
$\bar{1}\cdot4434742$
Log. 16 × 2 = 2·4082600
,, 1350 = 3·1303338
Q = cubic feet per hour, 95,951 = 4·9820480

Or to arrive at the same end by a shorter method, multiply the results obtained under a 1-inch pressure by the square root of the numerator in the fraction ¾, and divide by the square root of the denominator—thus:

$$\sqrt{4}\ (= \cdot6324) : 110{,}794 :: \sqrt{3}\ (= \cdot5477) = 95{,}954;$$

or briefly $$\frac{110{,}794 \times \sqrt{3}}{\sqrt{4}} = 95{,}954.$$

If the algebraical formula is objected to, it can very easily be resolved into a simple mathematical equation, as detailed in "Clegg." The principle is precisely the same, but the results are uniformly less, for reasons which will be obvious, and not quite so accurate as when logarithms are employed. Thus, adapting the foregoing experiment to these rules, we have in the first place to multiply the pressure by the diameter of the pipe, both in inches.

$$1 \times 16 = 16.$$

Second, add to the length of the main in yards its diameter in inches, and multiply the sum by the specific gravity of the gas. Divide the product by the results of the first term, and extract the square root of the quotient.

$$280 + 16 = 296 \times 0{\cdot}556 \div 16 \sqrt{10{\cdot}285} = 3{\cdot}163$$

Third, multiply the square of the diameter of the pipe in inches by the constant 1350, and divide by the results of the second term.

$$16 \times 16 = 256 \times 1350 \div 3{\cdot}163 = 109{,}263 \text{ cubic feet per hour.}$$

In conclusion, I have only further to add that I have gone over and wrought out the formula as given in Clegg, pp. 291–295, and have arrived at precisely similar results. The coefficient 1350 in the formula is correct so far as I can judge. Any modern experiments, therefore, which seem to require a modification of coefficients to tally with the results of experiment is probably due to inaccuracies in some of the data. With the exception of two slight, but probably misleading errors in Clegg (one in equation V., tenth line from bottom, p. 293, where we find $C = \pi d$ instead of $C = \pi d$, which being corrected, we obtain $(\frac{1}{4}\,g) = \frac{1}{64}\,38 = \cdot0156$; the other is in "Practical Rules," third line from top, p. 295, where we find a small "s" substituted for a capital S, which is improper, ·07688 = weight of a cubic foot of the gas = S) I venture to express as my belief, that the article on "The Flow of Gas through Pipes," as detailed in his treatise, is the most valuable elucidation of the subject that has yet appeared, and a safe and reliable guide in the hands of the gas engineer.

CONSTRUCTION AND THE CHOICE OF MATERIALS FOR GAS APPARATUS.

By Mr. R. DEMPSTER, of Elland.

I am not aware that this subject has ever been treated at any of our meetings, and I have, therefore, chosen it for a new line of thought.

It would be too lengthy a paper to consider this subject through all the departments in gas manufacture. I will, for the present, consider only what we call the carbonizing department; and at some future meeting, either I, or preferably some other engineer more able than myself, may deal with this subject beyond this point.

First, then, I shall consider from the retorts or furnaces up to and including the chimney, but I shall not notice the retort-beds and settings, because many capital papers, with drawings, have already been given at our past meetings, and to tread the same ground again would be unprofitable. Besides, I consider every manager knows his own requirements best, whether they should be beds of fives, sixes, or sevens. It is no uncommon thing for many architects, engineers, and managers, in preparing plans and specifications, to take little notice of the selection of materials best adapted for the different objects they may have in view, but simply to go on treading in the beaten track of their forefathers.

With regard to gas apparatus and gas manufacture, the materials generally selected for the retort-bed are perhaps the best and most defined, for they are narrowed down to a very small number—viz., common bricks and fire-bricks; nor has nature or science yet discovered anything to substitute or assist either of them, therefore they are well defined; for none can dispute the refractory properties of fire-bricks as the best material known at present for standing fire. Fire-bricks owe their refractory properties to the large per centage of silica they contain, and this property increases in proportion to the absence of lime, oxide of iron, magnesia, &c. This property is greatly increased if a proper quantity of ganister is ground up with the fire-clay. The peroxide of iron usually takes the form of little black specks or mottled particles which are embedded in the material, and can be plainly detected upon breaking the brick. When ganister is mixed with the fire-clay, they are called ganister bricks; they are best adapted for the furnace linings and settings, but as ganister renders the brick soft, I find it is unadvisable to build the retort-beds with them. It is a well-known fact that, until the ganister fire-brick was dis-

covered, the furnace-linings of iron and glass works, whose heat is far more intense than that of gas furnaces, were generally burned out about every two months, whereas now they will last double that time.

It may not be generally known that there exists in nature two kinds of fire-clay, and though often found in the same locality, and, indeed, under the same soil, yet they are very different in their nature and appearance. The top bed is of a rocky nature, bluish in colour, and not much softer than ordinary sandstone, and in general has to be blasted in the workings. This kind of fire-clay differs in many ways from the lower bed; firstly, when made into a fire-brick, and while under the cutting heat of the furnace, it never expands, but diminishes in size until the joints become very wide; secondly, it stands the fire much better than the lower bed, probably owing to the small per centage of peroxide of iron and lime contained in it. This top bed of fire-clay averages about 65 per cent. silica, 32 per cent. alumina, and 3 per cent. of peroxide of iron, lime, magnesia, &c.; thirdly, it is not at all adapted for the manufacture of retorts or bricks for brick retorts, for these particular reasons—first, owing to its liability to contraction; secondly, on account of its very porous nature, so porous, indeed, that when retorts are charged for the first time, it is no uncommon thing to find that there has not been any gas made, though not a particle of leakage is to be seen about the retort. In some cases I have seen the second charge nearly spent before gas-making has commenced. I can only account for this strange phenomenon by the affinity of the fire-bricks for the carbon. Absorbing it as it is made, and continuing to do so until it is fully charged. I may say that I have seen retorts that have been broken and pulled out, having been charged only once or twice, fully charged with carbon in their section. Another feature in this fire-clay is that retorts made from it are liable to become rapidly covered with carbon where no exhauster is used.

The white or lower bed of fire-clay is generally found from about 40 to 120 feet below the top bed. It is more plastic in its nature, occasionally, the same as common red clay. The bricks or retorts made from it expand under heat, so much so that I have seen four strong cast-iron stays broken in one single bed of brick retorts. The expansive nature of this clay is probably due to a less per centage of alumina than in the former, and a larger per centage of silica, lime, magnesia, &c. This fire-clay contains about 74 per cent. of silica, 22 per cent. of alumina, and 6 per cent. of peroxide of iron, lime, magnesia, &c., and it is best suited for the manufacture of fire-clay retorts or bricks used in constructing brick retorts where the property of expansion is an advantage.

Ganister is a hard siliceous rock found in many parts of England. In appearance it resembles ordinary sandstone; it has great refractory properties, standing nearly as high as the Dinas rock found in the Vale of Neath, Glamorganshire, it having about 95 per cent silica; it is used in certain proportions with fire-clay. The bricks made in this way are very soft, owing to the diminished per centage of alumina to bind the particles together. The bricks are so soft that the edges cannot be retained, and are easily broken in transit.

It is not advisable to build the first course above the grate bars of the furnace with them, owing to the mechanical action of the stokers bar. From their extreme tenderness they will not likely prove a success, unless they get into the hands of skilful workmen. These bricks are held in high reputation in large iron and glass works.

But whatever great advantages fire-bricks may have in the retort-bench, nowhere are they more so than in the retort-house chimney, and nowhere is the selection of materials more neglected. Now, as fire-brick is one of the best non-conductors of heat, it recommends itself to us as the best adapted for the lining of our chimneys. Its action is as follows:—Being a non-conductor, it retains the heat within itself, consequently the interior or lining of the chimney rarefies the air within it, causing it to pass up the chimney at a greater speed, and as nature abhors a vacuum, so must the air rush in through the furnace to fill the vacuum. Hence the reason for the draught. I think it advisable that chimneys should be lined with fire-bricks at least 4½ inches thick to the top, the difference in cost being so trifling in comparison with the permanent advantages gained.

I have no hesitation in saying that the retort-house chimney has more to do with the results in carbonizing than is generally supposed, and that, in my opinion, from 500 to 1000 feet per ton may be the difference between a good and a bad chimney.

Red brick is a better non-conductor than stone, and they stand relatively nearly as 1, 2, 3. Having tested the draught of a chimney built entirely of stone, another of stone lined with common bricks, and a third of stone lined with fire-bricks to the top, the proportions of the chimneys being nearly the same, the results obtained were as follows, viz:—

1. Stone . . . . . 5-10ths draught.
2. Common bricks . . . . . 10-10ths ,,
3. Fire-bricks . . . . . 15-10ths ,,

And this is the most I have ever been able to get from any chimney, however high.

Again, we occasionally see another fashion introduced by some architects. We very often see a very high and beautiful chimney, high enough and wide enough for double or treble the work for which it was intended, and was no doubt erected for the purpose of causing a draught; but, on looking near the bottom, you will find six or eight gratings round the base, and inside you will find air channels proceeding inwardly just behind the lining, and then proceeding upwards nearly to the top of the chimney. I have seen such a work pointed to as a great achievement, an important discovery, and worthy of imitation; and if you ask why it has been so constructed, you are modestly told it is to keep the chimney cool, in one sentence showing that nothing is known of the materials dealt with nor of the common laws of nature.

Now, it must be obvious that a vast amount of money is wastefully expended to accomplish an object, and by one false act it is entirely destroyed—viz., by cooling that part which requires to be maintained at the greatest possible heat. It has been said by some that these openings admitting air prevent the chimney from cracking. This may be so, but it is an expensive way of doing it; and, for the benefit of those who may adhere to this idea, I would suggest the closing of the bottom air channels entirely, and they would then have the pleasure of seeing their chimneys maintain their entirety, and also the pleasure of seeing the work of the chimney wonderfully increased.

Chimneys built internally on this annular principle are good, inasmuch as they keep the inner lining independent of the outer building, and thus prevent the cracking.

In constructing a chimney, the following rules may be adopted with advantage—viz., that for every retort to be heated not less than 25 inches of air space is required in the grate-bars or furnace, or, in other words, for a bed of five retorts 125 inches, and for a bed of seven retorts 175 inches of air space. Now, as the minimum temperature at the end of the retort-bed, or between the retort-bed and the chimney, is generally found to be about 750° Fahr., and assuming the air to be 50° Fahr. previous to entering the furnace, there is left 700° Fahr. for expansion, and as air expands about ½ per cent. for each degree of temperature, the actual space required for each bed of 5 retorts at work will be 220 inches, and for every bed of 7 retorts at work 308 inches.*

But how often do we find a retort-house chimney expected to be fit for more than double this amount of work. Its power is never consulted, but so long as it stands it has to do the work set apart for it, and often the engineer and the retort-setter are blamed for their performance if the retort should fail to heat.

Serious mistakes have been made where the chimney is placed at some distance from the retort-bed, and the main flue carried towards it underground, by allowing the earthwork to come in contact with the sides of the flue. The moisture of the earthwork is continually drawn towards it by the action of the heat, thereby cooling it and seriously injuring the draught. This may be obviated by having a burr wall on each side, the faces of which should be say 5 or 6 inches from the flue, or should this be considered expensive, then excavate say 12 or 18 inches each side the flue, and fill up the space with rubble stones, say about 3 inches square. The object in either case is to prevent the earthwork coming in contact with the flue. Many a bad draught has been remedied by either of these applications.

Now, in these days of high-priced coal and labour, every engineer and manager needs to inquire into, and not rest contented till he is satisfied that he is right at all points; otherwise he will find that he cannot comfortably compare notes with his professional brethren, and will be misled into laying blame to that to which it does not attach.

Now, then, as to the height of the chimney. This is a point upon which there may be a greater variety of opinion than in the former, and perhaps more complicated, inasmuch as fire-bricks are not all alike good non-conductors. It may be asked, "What use is the chimney at all?" and a very proper question too. This brings to my mind a circumstance which occurred when I was with the Phœnix Gas Company, London, nearly twenty years ago. The then respected superintendent of the Greenwich station had something wrong with his retort-house chimney. Having top draughts to all his settings, he at once took off one or two flue covers from each bed of retorts, and to my astonishment as well as his, he maintained very good heats, and his results were very little short of those obtained with the aid of the chimney—indeed, they were better heats than some I have seen with chimneys considerably over 100 feet high. And I have no hesitation in saying that a chimney is often a hindrance rather than a benefit. But as to the required height, we shall endeavour to arrive as near as possible at a fixed point. Seeing, then, that a fair, though not a first-class heat can be maintained without a chimney, and that with a bad, yet even high chimney, no better heat can be produced, where then is the point to fix a definite height? As I said before, it seems that the extreme height of the chimney has nothing to do with, and cannot increase the draught beyond a certain point—viz., 15-10ths. I may say I tested a very good chimney, some few weeks ago, 300 feet high, and it only gave 15-10ths—no more than you may obtain from a chimney, properly constructed, 50 feet high. The height in excess can only be advantageous for carrying the vapours to a higher level, especially where coke is employed, as the vapours from coke are more destructive to vegetation than from coal. And it may be said by some that very good heats can be maintained by chimneys even under 50 feet high. This may be so, as I said before, owing to the difference in the nature of the fire-bricks and its good construction, when even a higher temperature than 750° Fahr. may be delivered into the chimney. The temperature of a chimney varies very much. When at the bottom you may find 750° Fahr., at a height of 50 feet it will be about 550° Fahr., at a height of 100 feet it will be about 350° Fahr., and at a height of 150 feet it will be about 200° Fahr.

In conclusion, I have confined my remarks, as I said at the outset, strictly between the two points—the furnace and the chimney; and as I consider the subject so extensive as to furnish a series of papers, I trust some other engineer will either take up the continuance of the subject, or take part along with others in doing so.

* Since writing the paper I have tested some chimneys, in one of which I found the maximum to be 2300° Fahr., but at this point the top of the pyrometer was seriously injured.

We have been requested to intimate that on the evening of the *conversazione* a silver watch was left at the Museum of Science and Art, Edinburgh. The owner can obtain it on applying to Mr. A. Galletly, at the museum.

ALFORD GAS COMPANY.—The recently formed company took possession of the gas-works on the 1st inst. Owing to several improvements which are being made in the machinery, it is anticipated the price of gas per 1000 feet will be reduced from 7s. 1d. to 6s. 8d.

DEATH OF MR. JOHN BUGBY.—This gentleman, who for 34 years was secretary of the Brentford Gas Company, died at his residence, on the 23rd ult., from an attack of apoplexy, in the 55th year of his age. He was a man of great intelligence, and deservedly respected by all who knew him.

DEATH OF MR. GEORGE HALLETT.—It is with regret that we record the sudden death of this gentleman, which took place at his residence, Goddington Chelsfield, Kent, on the 22nd ult. Mr. Hallett was a partner in the well-known firm of George Hallett and Co., of Rotherhithe, and for many years was a director of the London Gas Company. He was 62 years of age.

MALTON GAS COMPANY.—The annual meeting was held on Tuesday, July 29—Mr. W. Simpson presiding. Notwithstanding that the advance in coal was equal to 9d. to 1s. per 1000 feet, it was decided to allow the price of gas to remain at 4s. 6d. per 1000 feet. The usual dividend of 8 per cent. per annum was declared, carrying forward a balance.

DUMFRIES GAS-WORKS.—The Gas Committee of the Dumfries Police Commission have recommended that no further steps be taken for the acquisition of the gas-works in this town. The commissioners, however, at their last meeting, disagreed with the committee, who were discharged, and a fresh committee appointed to renew negotiations with the gas company.

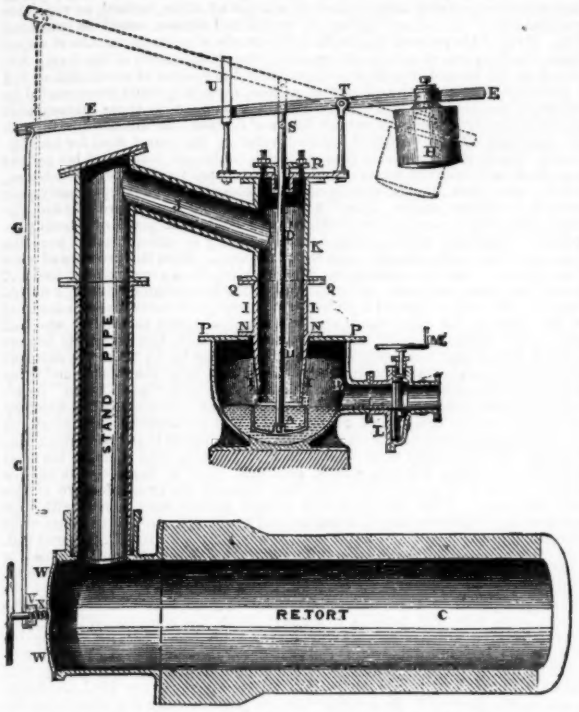
ADVANCES IN THE PRICE OF GAS.—The directors of the Maidstone Gas Company have issued notices informing their consumers that on and after the 1st of October the price of gas will be raised to 4s. 6d., and a notice has been issued by the Newcastle and Gateshead Company raising the price in their districts to 4s. from the 1st ult. The Moffatt (N.B.) Company have raised the price to 9s. 2d. from Sept. 1, and the Largs (N.B.) Company from 7s. 6d. to 7s. 11d. At Leominster the price has been raised from 4s. 2d. to 5s.

WATER SUPPLY OF JERUSALEM.—Mr. Henry Lumley, writing to *The Times*, says: "Those who take an interest in the matter will be glad to learn that the Turkish Government itself recognizes the difficulties and distress arising from the scarcity of water in Jerusalem, with its 25,000 inhabitants, and is doing its best to mitigate the evil; for his Excellency Nasif Pasha, late Governor of Jerusalem, before he left the city, in conjunction with Youssouf Effendi, the municipal chief, repaired and put into working order the Aqueduct of Solomon, so that it conveys water from Ain-el-chader (the Sealed Fountain) and the adjoining Pools of Solomon into the city. As the aqueduct passes by Bethlehem, that town also receives a supply of water from it. There are now four stations in Jerusalem where the inhabitants can obtain water without charge. Those of your readers who are acquainted with the topography will know the localities. Two of the fountains are in the extensive courtyard of the Mosque of Omar (the Temple area), a third is in the law court (Mah Kamé), a fourth in the same place, near the mosque called Bab-el-Simsle, and a fifth near another gate of the mosque called Bab-el-hadid. Thus the Holy City is in possession of a temporary supply of water—unfortunately it is but temporary. What has been done is, however, important as an evidence of the goodwill of the Turkish Government. It is to be hoped that the firman will not much longer be delayed which will enable those who have at heart the task of rescuing Jerusalem from the disease and misery which are so rife there to provide every house with a constant and plentiful supply of water.

MOVEABLE SEAL FOR HYDRAULIC MAINS AND SELF-ACTING HYDRAULIC SAFETY-VALVE.

At the Meeting of the British Association of Gas Managers, at Edinburgh, in June last, Messrs. Thomas and Caffalls, of Alton, exhibited drawings of two inventions recently patented by them at home and abroad, the first being a moveable seal for gas hydraulic mains, and the second a self-acting hydraulic safety-valve for preventing the back flow of gas from the gasholder.

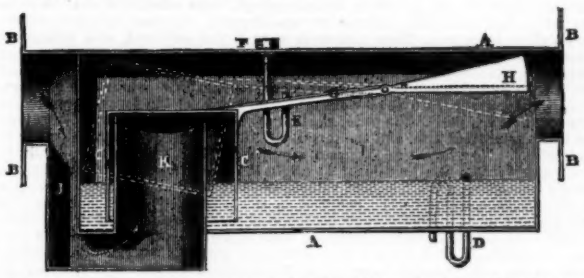
The annexed engraving represents the former of these inventions, and it will be seen that the employment of a liquid oint within the hydraulic main is one of its most important features. This not only prevents a back rush of gas at the time of discharging the coke from the retort and recharging it with coal, but preserves the retort from the deposit of carbon.



The apparatus consists mainly of a cup A, arranged within the hydraulic main B, between the retort C and the condenser or exhauster, the cup A being connected by a vertical rod D to a rock lever E on the outside of the H-pipe F, so that by releasing a rod G depending upon the rock lever E, the cup A is permitted to rise by the action of a counterpoise H, on the free end of the rock lever E, to immerse the bottom end of the connexion I therein, the connexion forming the passage between the retort C and the main B. The cup A is charged with tar or other liquid at first starting, and, as the gas is being made, fresh portions of tar are deposited within the two legs J K of the H-pipe, and these fall or trickle down the connexion I into the cup A to keep it constantly full, the overflow being retained in the hydraulic main B by its basin-shaped bottom. The height of the tar in the main B is governed by a valve L, which can be raised and lowered by turning the handle M. The invention further consists in tapering the bottom end of the connexion I within the main B, and in making the exterior of the cup A of the same diameter as the upper part of the connexion I, which is below the flange N, resting upon and bolted to the top plate P of the main. This connexion I is carried up some distance above the top of the main, and has another flange Q to enable it to be bolted to the flange on the bottom of the leg K of the H-pipe. The upper end of the vertical rod D is packed gas-tight within the gland R by asbestos, and its link S permits the free action of the rock lever E upon its pivot pin at T in the rock movements. The fore end of the lever E is embraced by a guide U, and is thereby prevented swinging to one side, when the rod G is thrown to one side by the attendant when he desires to "draw" the charge of coke from the retort. The lower end of the rod G is hook-shaped to take under the strap V of the retort-cover W, so that on releasing the screw X the attendant must first release the hook, and the counterpoise then causes the vertical rod D and the cup to rise, and seal the joint effectually and hermetically against the back pressure of gas from the condenser.

The inventors state that this apparatus was tried on one of the retorts of a bed of five in the gas-works at Alton, Hants, the other four having the usual dip-pipe (2-inch dip) in the hydraulic main. After being in use for 28 days, the four were found to have 2 inches of carbon upon them, and required to be scurfed, while the one to which this apparatus was applied was found to be perfectly clean, there being no deposit whatever upon the interior of the retort. The result of the experiments there is so satisfactory to the directors of the company that they have given orders for a bed of five, which has been fixed, and is now in operation.

The object of the second invention is to prevent a back rush of gas from the gasholder, should an accident happen to any part of the plant, or from one gasholder to another, on the gas from one being withdrawn for lighting purposes. It is also designed to assist in the purification of gas on its passage to the holder by causing it to come in contact with lime water or other purifying agent within the apparatus, or to increase the illuminating power of the gas by causing it to pass through a volatile or spirituous body in the same manner. The apparatus can also be used as a bye-pass self-acting valve in case of stoppages in condensers or scrubbers.



The apparatus consists of a rectangular-shaped box, A, attached to the pipe between the purifier and gasholder by the flanges BB, so that the gas in passing through in the direction of the arrows lifts the bonnet C into the position shown by dotted lines. The box A contains tar water or other liquid up to a certain level, and the bottom edge of the bonnet dips into the liquid when the ingoing pressure is removed, and also when a back pressure occurs from any cause. The level of the liquid is regulated by the syphon leg D, whose outlet is at the necessary height from the bottom, the bend and depth of leg forming a liquid joint against escape. The vessel is supplied with liquid by the bent pipe E, whose cap F can be removed when fresh liquid has to be poured in. The bonnet is connected by a rock lever G with a counterpoise H on its opposite end, the lever being held by a rod stretching across the vessel for that purpose. The gas on entering from the purifier passes down a "flat pipe" J, into an open-ended outlet K, which is covered by the bonnet C, but which can be lifted to the required height by the gas to allow it to pass. The gas then traverses along the vessel, and finds its way to the gasholder to be stored for use in the usual manner.

Pontefract Public Lighting.—The streets of Pontefract for several nights lately, pending negotiations between the corporation and gas company, were in a state of total darkness. The directors of the gas company met a committee of the Town Council, chosen to finally settle the question, on the 5th inst., and the result of the interview was a decision to affix one meter to every 15 lamps, and take the lamps into the hands of the corporation for 12 months.

Lincoln Gas Company.—An extraordinary meeting of the shareholders in this company took place on the 2nd inst., when it was resolved to create new capital to the extent of £20,000, under the powers of the Act obtained this session, in 400 shares of £50 each. These will be distributed amongst the shareholders in proportion to the interest they hold in the company, and if not thus disposed of, those unappropriated will be then offered to the public by auction. A meeting of the directors was subsequently held, at which it was resolved to make a call of £10 per share on the new capital, payable on the 8th of September.

Boston Public Lighting.—At the meeting of the Boston Local Board, on the 5th inst., the surveyor stated that the meters had not yet arrived, but the lamps were being replaced on the pillars, and it was proposed to begin lighting again on the 13th inst. The mayor said he had had some talk with the chairman of the gas company as to the terms on which the lighting should be done until the meters could be fixed. It was proposed that the board should fix a scale of hours, and that the company should charge for a consumption of 5 feet per hour at the rate of 5s. per 1000 feet, with an addition of 10d. per lamp per month for lighting, extinguishing, &c. Some discussion took place on this proposition, and the question was eventually disposed of by empowering the Lighting Committee to make the best arrangement they can with the company until the meters can be put down.

Whitby Public Lighting.—At the quarterly meeting of the Town Improvement Commissioners on the 5th inst., the clerk read a communication from the gas company, stating that, after full consideration, the directors could not alter the terms of supply which they had offered, but were willing to refer the dispute to arbitration, as they were charging within their parliamentary powers. At £3 2s. 6d. per lamp, it was only 4s. 6d. per 1000 cubic feet, while their Act entitled them to charge 5s. per 1000. Upon this the joint committee of the commission and the local board recommended that the price required by the gas company be conceded, though they were unanimously of opinion that the price asked was higher than ought to have been demanded. It was then unanimously resolved that the proposals of the gas company be accepted for one year, and that a contract be executed.

Alliance and Dublin Consumers Gas Company.—It is satisfactory to be in a position to state that an understanding has been come to between the directors of this company and the shareholders committee, which promises to put an end to the dissensions which have lately prevailed. It will be remembered that at a meeting of shareholders, held on the 7th ult., a requisition to the board was adopted, calling upon them to convene an extraordinary meeting to take into consideration the position of the company's affairs, and to adopt certain stringent resolutions in reference thereto. The directors convened that meeting for the 18th inst., but it appears that, at their request, a deputation from the shareholders committee waited on the board for the purpose of a conference, on the 5th inst., when suggestions were made by the directors, which were favourably received by the committee. We believe that the result of this and subsequent interviews is that the whole of the directors will place their resignations in the hands of the shareholders at the ordinary meeting of the company on the 30th prox., to which date the extraordinary meeting will be adjourned, and that a special meeting for the election of a new board will be held at the same time. The directors have adopted in this matter a wise and conciliatory policy, and we trust that the shareholders at large will act in the same spirit, so that measures may be taken to restore the prosperity of this most important undertaking.

Hull Gas Supply.—The report of Mr. Baynes, pharmaceutical chemist, for the month of July shows that the quality of the gas sent into the Sculcoates and Myton district by the British Gas Company was satisfactory. No traces of free ammonia and sulphuretted hydrogen were found. The results for the month, with Sugg's standard burner, are:

	Max.	Min.	Mean.
Illuminating power, standard sperm candles .	14·80	14·21	14·57
Grains of sulphur per 100 feet	28·40	25·40	26·90
Grains of ammonia per 100 feet	—	—	0·60

Mean barometer and temperature in experiment-room—bar., 30·10; temp., 65°.

Bursley Public Lighting.—At the meeting of the Local Board of Health for Burslem, on the 16th ult., the following tender by the gas company for the supply of gas to the public lamps was submitted:—The lamps to be lighted as heretofore for half an hour after sunset until half an hour before sunrise, from the 1st of August until the 31st of May inclusive. Each lamp to be supplied with 5 feet of gas per hour, and to be lighted, cleaned, extinguished, and maintained in good order until worn out, at the cost of the gas company. The charge for each ordinary lamp to be £3 5s. per annum, to be paid in two instalments. In an accompanying letter, Mr. H. Woodall, the gas company's manager, said he was instructed by the directors to express their regret that, having to pay an advance equal to 200 per cent. upon the price formerly paid for coal, they were obliged to make a considerable increase in their charge to the board per lamp. But, as at £3 5s. per lamp the price paid per 1000 cubic feet consumed was considerably below that now being charged to any consumer, the directors felt persuaded the board would give them credit for a disposition to meet them to the extent of their ability. After some discussion, the tender was referred to the Highways Committee, with instructions to put themselves in communication with the local authorities of Hanley, Tunstall, and other neighbouring towns, as to their gas contracts, and report to a future meeting. The board held a special meeting on the 31st ult., when it was decided to decline the tender, and to offer to the company £3 per lamp.

SIR WILLIAM FERGUSSON ON AN EFFICIENT WATER SUPPLY.

At the opening of the Session of the British Medical Association at King's College, London, on Tuesday, the 5th inst., Sir WILLIAM FERGUSSON, the new president, delivered his inaugural address, in which, after some introductory remarks, he referred to the address of his predecessor, Mr. Baker, who, he said, left the ordinary beaten track and adroitly seized on a subject which possessed, for the time, an interest even more exciting than ordinary professional subjects. The town of Birmingham and its surroundings, the topography of the district, its great factories, its deep mines, out of which so much of the wealth of England had been developed, were themes which proved most attractive, and every one present felt that he was listening to a story of England's greatness, described by one whose lifelong residence in the district, and whose talents and acquirements qualified him in a high degree for the duty he undertook. Conjecturing what he (Sir William) might say on this occasion, he naturally, from the local example of last year, thought what a subject he had before him were he to take London and its environs. With a history well-nigh as old as our knowledge of the island of Great Britain, with a progressive aggregation of humanity larger than the world had ever seen, there were materials for hundreds of addresses, and it might be allowed that the valley of the Thames, however beautiful as regards its surface or interesting as the largest and most populous in our island, lacked much of that special interest which engrossed the attention and occupied the labours of modern men in reference to the mineral products from underground. There was nothing in the London clay, nothing in the geology of the valley of the Thames which could compare in interest with under-surface matters in other parts of the country. There were, however, certain features connected with the valley of the Thames which seemed worthy of special attention; and questions might fairly be raised as to the hygienic condition of the locality. He supposed there could be little doubt that those who planted London as a post or capital looked to the ground on which the Tower stood as a good commanding position on the estuary of the Thames, and that little was thought then of the teeming millions of subsequent inhabitants who would populate the town and valley above. At that date there must have seemed a world of waters sufficient for all after years; the question of drainage would then be little thought of. In primitive times, springs, river sides, and shallow wells were the chief immediate sources of water supply. As years rolled on, where population increased, these resources were found deficient, and additional ones, in a higher style of engineering, were required. He was more impressed regarding the civilization of the Romans, by what they had left indicative of their efforts to give supplies of water when required for health and comfort, than by any other features now extant. The great conduits which testified to the engineering skill of the time, as also to the expenditure incurred in regard to this necessity of life, and the remains of their baths, were ample proofs to this effect. To many it might seem strange that he should refer specially to such a subject on this occasion. It might be thought to pertain chiefly to water companies, engineers, and ratepayers, but in reality it pertains to the public at large, to public hygiene, and in the latter respect peculiarly to this profession; and for such reasons he knew of no section of what is now often called state medicine more interesting than that of water supply "where men do congregate." It was right and fitting, in his opinion, that at a meeting such as this some special reference should be made to the subject. Next to the treatment of disease and accident, it stood foremost in professional minds, for water was as much a question of food as any other dietetic material that can be named. Our supplies of vegetables, of fish, of animal material, came possibly second in importance to this necessary of life. Mother Earth herself took nourishment from her own direct produce—effete vegetation, from the decay of fish, and the *débris* of animal life; but all these would count for nothing if she were deprived of water nourishment. Rational physiology might be called the philosophy of life, and the profession claiming physiology as one of the highest departments might claim, as the most skilled conservators of public health, that their opinions regarding water supply should hold due influence over the public mind. It was to the honour of this and all other similar meetings that almost every paper in the sections was devoted to the amelioration, the mitigation, the suppression of disease. In law, man dealt with what man had done or chose to do. In diseases, the profession dealt with causes and courses which, in general terms, might be said were far beyond the ken of man; they came in contact or into collision with nature in varied aspects and phases which the wise thinker in the profession would hardly venture to explain. It was at this point, perhaps, that the profession had from time to time broken down by attempting too much. Who among them knew what miasm was? What sense was there in the idea that it might be averted or obstructed by coverings, or nets, driven away by fires, or frightened off by artillery? Yet all such theories had obtained more or less favour in the profession, even in the 19th century. Who among them could positively, in reasonable terms, define the physical condition of miasm as it once prevailed in the fens and swamps of Lincolnshire, or possibly even now lingered, if it did not dwell, in horrid perfection, on the banks of the Niger? It was to be hoped that the profession might in time be able to appreciate the palpable physical qualities of the great enemy in this shape. They had learnt empirically in time how to knock him on the head by force of quinine, but he was as impalpable now in these days of dengue as in the time of Hippocrates. But to return to common palpable matters irrespective of rivers of Biblical, classical, or strategical interest, there were few to compare with Father Thames. The wealth carried on his surface below London Bridge well-nigh defied calculation. Besides the large share of what might be called our domestic wealth, the argosies of every country in the world were welcome to his waters. There lay the true greatness of the Thames. There seemed no exaction that man could ask from such a father which had not been granted; yet it was most worthy of consideration how far those who had lived and now survived on his banks had dealt fairly with the great stream. The Thames, in his lower course, was one of the greatest highways of commerce ever known to man. In his upper reaches he had been one of the best or worst abused streams that the world had known. He had been at once called to be one of the essentials of life to the inhabitants on his banks, and the cloaca of human aggregation. His streams had been run shallow, and his clear waters had been dimmed by the filthiest pollutions, until the sense of man had, in a manner, revolted at the work. The river thus abused was, in the days of Henry VIII., declared by parliamentary document the finest salmon stream in his Majesty's dominions. This polluted upper stream was a large source of the water supply of the south and west of London. In many respects a "water question" was one of the most interesting in social life. It was as great now as when Moses struck the rock; water was an absolute necessary of life. Many of what were called comforts and luxuries might be absolutely dispensed with; but without water both vegetable and animal life would cease. Here, as in many other public and national questions, there was great diversity of opinion. The sources of supply, the quantity, quality, and expenses thereof, formed separate heads, of which various classes of the community took special notice. The quantity and quality were the features in which perhaps the profession were most interested. The public at large probably looked upon the sources and expenses as the most important features; but even here the profession, as ordinary citizens, were as much interested as were their fellows. In regard to quantity and quality, all seemed to agree that there should be the largest and best imaginable of both; no stinted time supply, but a continuous run of the finest. It seemed, however, next to an impossibility to have such in that locality. The Thames could not afford a sufficient supply unless his main stream were nearly run dry; nor did it seem possible, under the circumstances, to render the purity of that quantity such as should satisfy all. Filtering in great tanks on the river side, in cisterns or vases in the houses, hardly seemed to accomplish this; and he was tempted to say that possibly a fault lay on the side of the profession that they expected too much for themselves, and led the public to expect too much, on the score of what might be considered quality and purity. Moreover, they differed largely among themselves in regard to these points. As educated chemists, in reference to animal life and nourishment, they talked and wrote learnedly about elements. The purest water might be defined as that which held least saline, animal, vegetable, or earthy material. The physician thought so highly of this feature that in a fluid dose of medicine he ordered the bulk of the potion of distilled water; yet in that water he probably congregated an amount of saline, animal, or vegetable material which no natural spring or unpolluted stream could be compared with. He sent his patients hundreds or thousands of miles to partake of waters where the converse of purity was generally the chief feature of the fluid. But this, it would be said, was in accordance with the science of combinations and a just appreciation of the efficacy of salines, especially those compounded by nature in the bowels of the earth. He did not object to those impregnated waters as curative agents in certain forms of disease; he did not quarrel with the physician when he ordered distilled water as the purest fluid for his compound—but in either instance that physician could not fancy that his patient was about to drink pure water—it might be admitted that he had no such idea, yet the same man insisted stoutly on the necessity for unexceptionably pure water for ordinary drinks. This "Adam's wine" might be filtered, boiled, distilled, yet certain so-called impurities would hold their place or speedily reappear. Vegetable matter, animal matter, earthy or saline matter, were the bugbear of those who wanted pure water for man. Even the presence of a few fleas, to use a familiar expression, dead or alive, in a great natural basin of water, had been held as an influential objection to a scheme offering a double supply. He then supposed a pint of absolutely pure water given to the meal of the "pot of the day," the "working man," a model teetotaller who had taken a vow against alcohol and all fermented liquors, and asked his hearers to trace the frugal meal—say water and bread—as far as their physiological imagination could, down the intestinal canal and into the blood, and fancy from their knowledge the affluents thereon. Could "pure water" be recognized beyond the teeth in this downward course? Mucus, saliva, tonsillary secretions, mucus again, and gastric juice, and pancreatic, and biliary, all joined the ingredients of the simple meal. But suppose that the working man indulged in the luxury of a bit of beef or mutton, with some of the usual adjuncts—potatoes, turnips, greens, cabbages, peas or beans—what was the fate of the pint of pure water which was deemed the grand feature of this excellent fare? Here vegetable and animal matter were joined with pure water to an extent a thousand times beyond the imagination of the pure water theorist, and the bread and water system was simplicity itself compared with this. He supposed other cases in different classes of society, and he asked, as to the grouse and venison eaters, supposing them to be "pure water" men, what became of the water as soon as it was swallowed? What about the pleasing adjuncts to these delicious articles of food, and what (to those who were always referring to salts in waters) about the common salt which was consumed in quantities so palpably larger than those pointed out by the chemist in so-called saline waters? What could medical men say of the refinement in diet of the savage who preferred animal food in a putrid state to that recently killed, and uses such surface water, or any other kind, as chance might put in his way? He fancied that the pure chemist was often taken for a medical man, and he feared that many of the profession affected too much the airs of the pure chemist, too frequently jumbled up chemistry and physiology, so that the characters of each seem to suffer. He asked if they were not in reality too fastidious about "pure water." While the public, no doubt considerably influenced by the opinions of the doctors, haggled over this feature, the more important one of ample supply, for all the purposes of man, was overlooked. Although water for drink was essential to existence, how small in proportion was that compared with the requirements for sanitary purposes otherwise, such as cleaning, washing, in arts and manufactures. For man's stomach, the requisite quantity of wholesome water was so small that the trouble and cost of purifying by filtering and otherwise would be as nothing compared with the advantage of having what might be called a superabundance. If that superabundance was what the simple housewife called soft, the water desideratum would be fulfilled. He had heard on the best authority that in Glasgow alone, with a population of nearly half a million, where a large and wise expenditure had been incurred, there had been a saving of about £40,000 a year for soap, owing to the softness of the water from a natural reservoir, which doubtless was formed by the watershed of the district in which it lay. The good folks of Glasgow tapped the side of one of the most beautiful and classical of Scottish lochs, and brought the water through conduits some 40 miles long to place it at public disposal. The loch was none the worse, and the benefit to the citizens of the second city in the kingdom was, perhaps, incalculable. It seemed almost by instinct that, in the humblest of our cottages, and in most of our moderate unpretending dwelling-houses, there was a desire to have a supply of rain water. The pump or the nearest open well or spring might be resorted to for water to drink, but the small quantity that can be caught from a stone, tile, or slate roof was eagerly sought by the judicious housewife. The quality of this water suits domestic purposes better than the brightest from well or pump. Largely though this little luxury was indulged in—for the water-butt abounded in every district—it was curious how this sort of instinct had been neglected by many who have catered for the supply of water on a large scale. There were many who approved the project of increasing the supplies of Manchester, Birmingham, and other midland towns, including London, from the natural lakes of Cumberland and Westmoreland. But might not something be done, less stupendous, yet equally effective? Natural lakes, of sufficient bulk, were not to be found in many districts, but might not artificial ones be constructed, which would largely supplement our present water supplies? In most of the upland districts in this country there were spaces, hollows, ravines, and valleys where—as much of the surface is otherwise worthless—the water might be dammed up and lake above lake might be made to appear on the landscape. This was no new proposal, and it had been acted upon in countries of ancient historical date, where civilization was never equal to that we now boast of, and the custom prevailed to a considerable extent in this island. Look to the rainfall of a season in this country, and consider how much, or how little, of this gift from heaven was actually used by man. Of all the necessaries of life this was the one which came upon us in this island most bountifully, and yet how much it was neglected. Instead of letting the floods damage our best alluvial soils, destroy vegetable and animal life, endanger man himself, and finally flow uninterruptedly to the sea, might not much of this flood be impounded on our watersheds, and there form small and large reservoirs and lakes, which would be ample supplies of the best water at every season of the year, and even keep in fair volume some of those primitive streams which doubtless were the attraction of those who originally settled on their banks? It was distressing to see, in some of our large towns, to what condition these once fair streams had been reduced; the water was taken off above until the bed of the river had been dried, and then let on again in every imaginable degree of pollution. Under such circumstances, the water thus taken from the stream might be supplemented by the upper stores, or better still, these stores might be relied upon for most of the requirements of large communities. He had seen several severe droughts in this country, and had occasionally wondered what might be the result to animal life—man

and beast—if the general distress should continue a few days or weeks longer. This involved a great hygienic question; and, interested as they were in it professionally, taught as all were in the virtues of water—home-distilled, nature-distilled, home-filtered, nature-filtered—looking to the value of water to man as regards his internal and external bodily wants, he did not know any point of hygiene of more interest. Fish, sheep, and cattle can be brought in reasonable quantity—hundreds, it may be—in conserved condition, thousands of miles, but water could not be fetched such distances in sufficient quantity at reasonable terms. And here he could not but again express his opinion that in their professional capacity medical men might err grievously in making trivial and questionable objections to the quality of water when there seemed a fair prospect of getting that which was most desirable for man's use—a full, ever-flowing quantity which might give a perpetual current, day and night, well-nigh fresh from the dew of heaven.

Assessment of the Warrington Gas-Works.—The assessment on these works for the relief of the poor appears to have been raised from £3058 10s. to £3558 10s., such increase being made on the ground of the *increased profits* of the company. Mr. Jeans, law clerk, accompanied by Mr. Paterson, appealed against the increase made in the rates as resulting from the increase of profits, but was willing to be charged upon the additional capital expenditure since the last valuation was made in 1868, and contended that to assess personal profits was never contemplated by the Act. The Assessment Committee maintained the opinion that the profits of a gas company must be taken as the measure of their rateable value, and on that ground confirmed the rate. This principle, which appears to have been partially recognized by recent decisions, has resulted in converting the assessment for the relief of the poor into an income-tax on personal property of the most objectionable form, and until such time as a more equitable mode of valuation is adopted, it is much to be feared that this species of *black mail* will have to be submitted to by gas and water companies.

Wisbech Gas Company.—The report of the directors presented at the annual meeting of shareholders on the 28th ult. stated that the balance-sheet, though prejudicially affected by the high price of coal, was as favourable as could be expected under the circumstances, and in the opinion of the directors justified the payment of a dividend of 10 per cent. on the paid-up capital of the company. In the report presented at the last annual meeting, it was stated that contracts had been entered into by the company with the Local Boards of Health for the Wisbech and Walsoken districts, for the supply of gas to the public lights, from the 31st of July, 1872, for three years next ensuing, with power for either party to determine the contracts at the end of the first and second year, by giving three calendar months notice in writing to the other. In consequence of the necessity which existed for the directors at once to enter into a lengthened contract for coal at extraordinarily high prices, and the impossibility of telling how long such prices would continue, the existing low and inadequate charge for gas for the public lights became the subject of serious consideration; and it was resolved in April last to put an end to the contracts with the local boards at the expiration of the first year, pursuant to the power reserved, in order that a higher charge might be secured. Steps had accordingly been taken to determine the contracts. As to the ordinary tariff, it was unnecessary to do more than refer to the special resolution passed and confirmed at extraordinary general meetings of the company held in June last, for increasing the price of gas to private consumers. Full explanations of the circumstances which occasioned the rise in price were given to the shareholders at the two meetings, and accepted by them as sufficient.

Canterbury Gas and Water Company.—The adjourned half-yearly meeting of this company was held on the 1st inst—Mr. Furley in the chair. In their report the directors called attention to the fact that, as compared with the corresponding period of 1872, the sale of gas showed a decrease of 880,000 cubic feet. This, in the belief of the board, arose from the earlier closing of the shops and licensed houses in Canterbury, and the greater care used by consumers in consequence of the increased price. The directors had the satisfaction to state that the amount of leakage of gas on the quantity made during the same corresponding periods had been reduced 1,622,000 cubic feet—*i. e.*, from 14·36 per cent., at which it stood in 1872, to 9·85 per cent. in 1873. Mr. C. H. Gregory, the arbitrator appointed in the action brought by Mr. Homersham, C.E., against the company, had made his award, and directed the company to pay the plaintiff the further sum of £504 1s. The claim made originally by Mr. Homersham was £4039 7s. 4d., and by subsequent bills this claim was increased to £4748 1s. 9d. The amount which Mr. Homersham would receive under the award, in full satisfaction of all claims, was £3904 1s. The arbitrator had awarded that all the costs be paid by the company. These expenses, with the amount paid to Mr. Homersham, would be added to and form part of the water capital. The accounts showed a profit on the half year of £1791 4s. 4d. This sum, added to the balance on the profit and loss account brought forward from the last half year, made a total of £3002 15s. 6d., out of which sum the directors had, in accordance with the report adopted at the last half-yearly meeting, purchased £200 Egyptian Government, 1864, Bonds on the renewal account, and they now recommended that a dividend at the rate of 6 per cent. per annum on the capital of the company be paid, free from income-tax. The report was, after some discussion, adopted, and the dividend recommended therein declared.

British and Foreign Water and Gas Works Company, Limited.—The first ordinary general meeting of this company was held at Bartholomew House, London, on Thursday, Aug. 7—Mr. H. Labouchere in the chair. The directors report and accounts showed the result of the company's operations during the first year of its existence, calculating from the period of its registration up to June 30 last. The directors state that numerous negotiations had been commenced, many of which had led to no definite results, the directors being desirous of not assuming any liabilities without the clearest prospect of ultimate profits. One concession, however, that for the establishment of waterworks in the important town of Saratoff, on the Volga, with a valuable municipal guarantee, had been secured and arrangements had been made for completing the works with the least possible delay. The most favourable results might fairly be anticipated from this undertaking. Negotiations for other concessions in important European towns were in progress. The Beyrout Water-Works Company had been recently introduced under the auspices of this company, the necessary capital had been subscribed, and the liability for payment of interest by this company during the construction of the works was fully covered. Pending the carrying out of existing engagements, the directors proposed that out of the £7317 2s. appearing to the balance of profit and loss account, a dividend of 6 per cent. for the year ending the 30th of June be paid on the amount called up on the shares, which would exhaust £2388; leaving £4929 2s. to be carried forward. The chairman, in moving the adoption of the report, stated that the prospects of the company were very favourable. An arrangement had been concluded for the purchase and extension of the gas-works at Bucharest. The concession for the Sanatoff Water-Works, in Russia, had been obtained on the same terms as that of Odessa. The report was adopted, and the dividend declared.

Extinguishing Street-Lamps.—At the Marlborough Street Police Court, on the 28th ult., Martin Murray, a tailor, was charged with extinguishing a street-lamp. A constable proved seeing the prisoner climb up a lamp-post and extinguish the light in the lamp, and on taking the prisoner into custody, he said it was an "accident." The prisoner said he asked several persons to give him a light, and as he could not get one, he climbed up the lamp-post for the purpose of obtaining one, and by accident extinguished the light. In reply to Mr. Newton, the constable said he saw no pipe at the time. Mr. Newton said it was a mischievous practice, and fined the prisoner 5s.—At Greenwich Police Court, on Saturday last, Charles Haldenby, of Stringer Road, Rotherhithe, was charged with a similar offence. Inspector Reynolds, R Division, deposed to seeing the defendant climb a lamp-post at half-past nine at night and put out the light. In three other adjoining lamps the light had also been put out. Mr. Maude imposed a penalty of 10s. and costs, or seven days imprisonment.—At Huddersfield Police Court, on Friday, Joseph Walker, of Outcote Bank, appeared upon a similar charge, and was fined 20s. and costs, or fourteen days imprisonment.

Birmingham Water Supply.—The water supplied to Birmingham in July is reported by Dr. Hill, its medical officer of health, to have been unusually turbid, and to have shown a considerable increase of organic nitrogen.

Glasgow Water Supply.—The Glasgow water supply, in July, drawn from Loch Katrine, contained considerably less organic nitrogen, according to the report of Professor Bischof, of the Andersonian University; although somewhat yellowish and very slightly turbid when seen through a stratum one mètre thick, the water was entirely free from any evidence of previous sewage or animal contamination.

Kilmarnock Water Company.—The annual meeting of shareholders was held on the 18th ult., at which the report presented showed a profit on the year's operations of £1386 16s., being upwards of £58 in excess of that of last year. This yielded a dividend of 6½ per cent., and left a balance of £77 12s. 8d., to be carried to reserve-fund account. The directors had completed the portion of the company's extensions through the hill at South Craig, as recommended by Mr. Gale, at a level that is expected will give a considerable additional supply of water, and these pipes they purpose extending to the town as soon as it was found necessary. Meanwhile, they recommended that a new reservoir should be provided immediately for additional storeage. The balance-sheet showed a revenue for the year of £2197 15s. 8d., and an expenditure of £810 19s. 8d., leaving a balance of profit amounting to £1386 16s.

Leakages in Water-Pipes.—At a meeting of the American Society of Civil Engineers, held in New York on March 19 last, Mr. Joseph Whitney made a statement of his own observations and experiments with regard to this subject, which he illustrated by specimens of defective pipes from the Cambridge (Massachusetts) Water-Works. He said the great and growing increase in the consumption of water is a matter of the first importance in the management of water-works. Scarcely a report relating to water-works is issued which does not refer to it, and as something quite unaccountable; still no systematic effort is made to ascertain its cause. Some years since his attention was called to the subject in Cambridge, where, for three years preceding, the water pressure had been growing less, thus causing much inconvenience and insecurity in case of fire. This was ascribed to the great number of users from one main—an 8-inch pipe. In a particular house the water scarcely rose to the second story at night or day. After inquiry a series of observations were made, with syphon-pipe and pressure-gauge, to determine the cause. These were made in the morning, when the consumption was nearly nothing; and in one case, by shutting off certain sections from the main—say a 4-inch or 6-inch pipe—a large leak was revealed where the pipe, laid in a street filled with oyster shells, had parted. In another case, when the gate was closed, the water in the syphon at once rose 16 feet—equal to about two storeys of an ordinary house. The pipe, about 600 feet long, and laid upon a marsh, was examined, and the leak found in a joint where the two parts had been entirely separated by a settlement of one section. These and other leaks, detected similarly, were closed, and thus, without any increase of size in the mains, an additional head was secured of 35 feet, which gave a full supply to each house in that locality. Observations were afterwards made upon the water in the reservoir in the night time, which showed still a leakage. By continued experiments upon the pipes throughout the city nearly 200 leaks, of from 1000 gallons to 2000 gallons each per hour, were found. The necessary repairs were made, and thereby the average daily consumption per head was reduced from 85 gallons to 35 gallons, which is not more than half that in most cities. Leakages of this character may exist a long time without being known. Thus, it may start when the water is first let on, and the water find a passage through some blind channel into the sewer; it will not be seen at the surface unless the upward and outward is the easiest course. It is quite probable that this subject concerns other cities than Cambridge, and furnishes a satisfactory reason for the great increase in the consumption of water, and the corresponding growing demand for supply which more or less embarrasses public authorities. It is said that in the City of New York the consumption is about 100 million gallons per diem. If so, he was sure 50 millions were wasted through unrecognized leaks into the sewers and surrounding rivers. In Boston more than 17 millions of gallons are supplied where eight millions should suffice. It is a fair presumption that one-half those great amounts—being but waste—and its corresponding cost in the construction and operation of water-works, may be saved. Surely examination, complete and exhaustive, should be made to determine whether this is presumption or fact.

Death in the Milk Can.—An outbreak of typhoid fever has occurred in the neighbourhood of Cavendish Square, and a curious circumstance attending it is said to be that all the persons attacked have been supplied with milk from the same source. Typhoid fever has been traced to milk before, but it was afterwards said that the true cause of the disease was in the water with which the milk was adulterated. In the present case, the purity of the milk—that is, freedom from aqueous dilution—is guaranteed by a company presided over by a distinguished sanitarian. When a friend of ours once complained of the quality of the milk supplied to her, the milkman promised that he would "speak to the cows about it." The Marylebone Vestry have sent their medical officer to speak to the cows rightly or wrongly implicated in this outbreak; in other words, to make an investigation at the dairy farm, and we hope some useful information may be gained from the inquiry. The Local Government Board have also sent Mr. Netten Radcliffe to investigate the matter.

Register of New Patents.

3152.—Day, J. J., Camden Town, "*A new improved high-pressure valve.*" Provisional protection only obtained. Dated Oct. 24, 1872.

The object of this invention is to prevent the waste of water or other liquids by means of a perfectly closing loose valve; this valve has a brass spindle secured through the centre which works through two guides, one in the body of the tap and the other on the under side of the seating where the spindle rests on an eccentric; it is then opened by the eccentric, through which a spindle passes, the spindle being brought through bearings at the sides of the lower part of the valve seating, and is turned either by the ordinary lever ball float, or by a T key or lever; the valve is closed by the eccentric being turned from under it, when the valve falls of its weight assisted by the pressure of the liquid, and is kept firm by the same pressure till the eccentric is again turned to allow more of the liquid to pass through it. This valve is also so constructed that the whole of the working parts may be easily removed for repairs or cleansing, without moving the body of the tap. The inventor does not claim any particular part, but the combination of the whole.

3153.—Chandler, S., senior, Chandler, S., junior, and Chandler, J., all of London Road, Southwark, "*Improvements in apparatus to be used in the*

manufacture of gas." Provisional protection only obtained. Dated Oct. 24, 1872.

This invention has for its object improvements in apparatus to be used in the manufacture of gas, and consists in the use of an angular bridge-pipe in lieu of the H-pipe. The advantages claimed for the invention over and above the old apparatus are—first, the lessening of the weight on the hydraulic main by nearly 50 per cent.; secondly, the reduction of cost of the apparatus; thirdly, greater facility for more effectually cleansing the ascension-pipe; and fourthly, less check upon the gas, as the passage into the hydraulic main is more direct.

3156.—GOLDSMITH, G., and DILKES, J., Leicester, "*Improvements in apparatus for roasting, baking, or cooking by gas.*" Patent dated Nov. 4, 1872.

This invention has for its object the more convenient and economical method of preparing food than that generally practised, and is specially adapted for roasting coffee. The apparatus consists of a rectangular chamber, in which a burner suitable for burning a mixture of gas and air is placed. On the top of the chamber a cylinder containing the material to be roasted or prepared is made to revolve by hand or other convenient power. The upper part of the cylinder and top of the case are closed in by a cover. The act of closing the cover puts pressure upon a lever, which opens a valve in connexion with the burner, and allows a sufficient quantity of gas to pass thereto to maintain the requisite heat. When the cover is raised, a spring closes the valve so nearly that only just enough gas can pass to the burner to keep the flame alight. The quantity of gas consumed when the apparatus is not in actual operation is thus materially reduced.

3180.—MALAM, A., Dumfries, N.B., "*Improvements in the manufacture of illuminating gas, and in apparatus therefor.*" Patent dated Oct. 26, 1872.

By one improvement comprised in the present invention the difficulty met with in using increased heat is overcome by cooling the exit-pipe and the part of the mouthpiece of the retort to which the exit-pipe is attached. The exit-pipe and mouthpiece are formed by preference of malleable cast iron, and a trough is formed on the mouthpiece and round the exit-pipe. The trough is kept constantly supplied with water. A second improvement consists in taking the gas, more particularly when obtained from cannel or similar rich coal, after it has passed through the condensers and has consequently parted with its watery and heavy tarry matters, and leading it through a second retort or set of retorts.

3192.—VAUGHAN, E. P. H., Chancery Lane, "*Improvements in the mode of and apparatus for generating gas for lighting and heating purposes.*" A communication. Patent dated Oct. 28, 1872.

The object of this invention is the manufacture of gas from "gasoline," by means of a generator divided into two compartments and fitted with a hollow shaft, one end of which carries a spiral metallic shell or volute, and the other a cylinder of porous material, both immersed in the liquid hydrocarbon. Motion being given by suitable gear to the hollow shaft, atmospheric air is forced by the spiral shell in the one compartment, through the saturated porous material in the other, and being thus converted into inflammable gas is distributed for use as required.

3193.—MACFARLANE, J. R., Manchester, "*Improvements connected with furnaces used in the manufacture of coal gas.*" Patent dated Oct. 28, 1872.

The object of this invention is to effect great economy in the consumption of the fuel used for heating retorts, by enabling intensely heated air to be supplied or drawn to the furnaces. Instead of allowing the cold air to pass into the open ash-pit, and between the grate bars of each furnace as at present, the front of the ash-pit is closed, and the air is caused to pass through a horizontal flue on the top or in the interior of the horizontal chimney flue, through one or more vertical flues in the retort oven, and through one or more horizontal flues connected with the ash-pit. The heated gases from the ignited fuel in their passage from the retort oven to the chimney flue and chimney cause the chimney flue to be of a great heat, and much of this heat is given off to the horizontal air flue, and the vertical flue or flues in the oven are as hot as the retorts, and therefore after the air passes first through the horizontal air flue, and then through the vertical flue or flues, it becomes intensely heated, and the combustion of the fuel is effected without any check of cold air.

3194.—COBLEY, T., Dunstable, and POYNTER, J. E., Glasgow, "*Improvements in obtaining caustic baryta.*" Provisional protection only obtained. Dated Oct. 28, 1872.

In carrying out this invention barium sulphide is mixed with heavy oil or creosotic liquor and submitted to distillation. A combustible gas is obtained, and after being freed from sulphur compounds may be used as an illuminating gas, or as a fuel. The caustic baryta may be washed out of the residue, or it may be applied in many cases in its crude coke-like form.

3208.—DAVEY, H., Leeds, "*Improvements in means of evacuating condensers of steam-engines, and apparatus therefor, part of which is applicable to the purpose of gas exhausting.*" Provisional protection only obtained. Dated Oct. 30, 1872.

This invention relates to means of removing the air and water from condensers, applicable in part to gas-exhausters. The air-pump is worked by an engine constructed according to patent No. 277, dated Feb. 1, 1871, driven either by water pressure or by steam, the escape water in the one case serving for condensation, and the waste steam in the other case passing into the condenser of the main engine. According to another means described, water under pressure works a turbine pump, which ejects the contents of the condenser, the escape water of the turbine serving to condense the passing steam. Such a turbine pump is applicable as a gas-exhauster, the escape water in this case serving to cool and purify the passing gas. For pumping-engines a condenser of the "blow through" description is employed, the injection being supplied from the pump, and consequently stopped while the engine is on the dead centres, so that the exhaust steam clears the condensers.

APPLICATIONS FOR LETTERS PATENT.

2482.—KNAB, D. C., St. Denis, France, "Improvements in the mode of utilizing all the products of distillation of combustible, vegetable, and animal matters in the production of gas." July 19, 1873.

2491.—LIVTARD, C. L., Paris, "An improved system of gas-burner, with lateral and covered jets." July 19, 1873.

2498.—CLARK, J. L., and STANDFIELD, J., both of Victoria Street, Westminster, "Improvements in hydraulic apparatus." July 19, 1873.

2503.—WHEELER, C. G., Chicago, U.S.A., "An improved apparatus for distributing water and regulating and controlling the passage of fluids through pipes or tubes." July 21, 1873.

2524.—NICHOLSON, R., Dulwich, "Improvements in machinery or apparatus for charging and discharging gas-retorts, and in apparatus connected therewith." July 24, 1873.

2527.—ST. JOHN, W. H., New York, U.S.A., "Improvements in processes for purifying illuminating gas, and apparatus therefor." (Complete specification.) July 24, 1873.

2532.—WHITE, W., Hampstead, "Improvements in the treatment of sewage and cesspool water." July 24, 1873.

2534.—ROBY, J., Manchester, "Improvements in treating sewage and other foul liquids for the economical removal and utilization of soluble and suspended impurities contained therein, and in apparatus for the same." July 25, 1873.

2543.—HEDLEY, T. A., Abchurch Lane, London, "Improvements in the manufacture, combination, and purification of gases for lighting and heating purposes, and in the apparatus employed therein." July 25, 1873.

2544.—MAIN, E. W., Newcastle-upon-Tyne, "A sanitary safety-valve for preventing the admission of foul air and gases into dwelling-houses, and their escape from common street sewers and drains." July 25, 1873.

2569.—FARROW, S., Ashton-under-Lyne, "Improvements in the construction of cocks or taps." July 29, 1873.

2599.—SEEGERS, L., Cecil Street, Strand, "Improvements in an apparatus for a gas economizer, an apparatus for increasing the illuminating and heating powers of coal gas with reduced consumption." July 31, 1873.

2602.—CASPER, E., Finsbury Circus, London, "Improvements in apparatus for supplying water to steam-boilers and other vessels, and in water-purifying apparatus to be used in connexion therewith or otherwise." A communication. Aug. 1, 1873.

2603.—SPICK, R. P., Parliament Street, Westminster, and HARTLEY, F. W., Stockwell Green, Surrey, "Improvements in carburetters." Aug. 1, 1873.

2609.—LILLEY, G. C., London Street, London, E.C., "Improvements in cocks or taps." Aug. 1, 1873.

GRANTS OF PROVISIONAL PROTECTION.

2339.—GRICE, R. W., Aix-la-Chapelle, Prussia, "Improvements in the manufacture of gas and coke, and apparatus connected therewith." July 5, 1873.

2352.—CAMPBELL, W. R., Hammersmith, and PARKER, J. W., Wood Green, Middlesex, "An improvement in gas-burners for use in street-lamps, offices, public buildings, and all places where gas is consumed." July 8, 1873.

2391.—WOTHERSPOON, J., and FOULIS, W., Glasgow, "Improved lids or covers for retorts, and improvements in making the joint thereof with the retorts." July 11, 1873.

2404.—ROBINSON, J., West Bromwich, "Improvements in machinery or apparatus for charging and discharging retorts, ovens, and furnaces." July 12, 1873.

2427.—SILBER, A. M., Wood Street, Cheapside, "Improvements in the construction of burners for the combustion of gas." July 14, 1873.

2453.—SOMERVILLE, J., Gas-Works, Dublin, and ROBINSON, J., West Bromwich, "Improvements in apparatus for discharging gas-retorts." July 16, 1873.

2471.—MULLER, J. A., Amsterdam, "Improvements in apparatus for measuring and registering the flow of water and other liquids." July 17, 1873.

2503.—WHEELER, C. G., Chicago, U.S.A., "An improved apparatus for distributing water and regulating and controlling the passage of fluids through pipes or tubes." July 21, 1873.

2524.—NICHOLSON, R., Dulwich, "Improvements in machinery or apparatus for charging and discharging gas-retorts, and in apparatus connected therewith." July 24, 1873.

INVENTION PROTECTED FOR SIX MONTHS ON THE DEPOSIT OF COMPLETE SPECIFICATION.

2527.—ST. JOHN, W. H., New York, U.S.A., "Improvements in processes for purifying illuminating gas, and apparatus therefor." July 24, 1873.

NOTICES TO PROCEED.

843.—HARRISON, C. W., High Holborn, "Improvements in apparatus for charging or impregnating atmospheric air with the vapour of hydrocarbon liquids." March 8, 1873.

912.—SYMINGTON, R. S., Glasgow, "Improvements in apparatus for dealing with sewage and other refuse or waste, so as to lessen the pollution of rivers." March 13, 1873.

1002.—PERRIER, J., Bedford Square, Middlesex, "A new glass gas-chimney, capable of resisting any degree of heat without bursting." March 19, 1873.

1072.—HARRISON, C. W., High Holborn, "Improvements in apparatus for charging or impregnating atmospheric air with the vapour of hydrocarbon liquids." March 22, 1873.

1917.—KIDD, J., Leadenhall Street, "Improvements in air or vapour gas machines, and in apparatus connected therewith." May 28, 1873.

2177.—HUNTER, A. G., Flint, "Improvements in apparatus for the manufacture of gas for illuminating and heating purposes." A communication. June 21, 1873.

2235.—BOUSFIELD, G. T., Sutton, Surrey, "Improvements in lamps to be used for cooking, heating, and lighting purposes." A communication. June 27, 1873.

2307.—GILES, B., Blackheath, Kent, "An improved apparatus for heating water." July 3, 1873.

2391.—WOTHERSPOON, J., and FOULIS, W., both of Glasgow, "Improved lids or covers for retorts, and improvements in making the joint thereof with the retorts." July 11, 1873.

2427.—SILBER, A. M., Wood Street, Cheapside, "Improvements in the construction of burners for the combustion of gas." July 14, 1873.

APPLICATION FOR LEAVE TO FILE A MEMORANDUM OF ALTERATION.

2510.—VINCENT, W., Arborfield, Berks, "Improvements in apparatus for manufacturing gas." Aug. 23, 1873.

NOTICE OF APPLICATION FOR LEAVE TO FILE A DISCLAIMER, &c.

3057.—SHEDLOCK, J. J., Upper Holloway, Middlesex, "Improvements in apparatus for the treatment of hydrocarbon gases and vapour, and for illuminating and heating purposes." Oct. 16, 1872.

PATENTS WHICH HAVE PASSED THE GREAT SEAL.

154.—SCOTT, H. Y. D., Ealing, Middlesex, "Improvements in the treatment of sewage, and of the deposits obtained therefrom." Jan. 14, 1873.

183.—SCOTT, H. Y. D., Ealing, Middlesex, "Improvements in the purification of coal gas." Jan. 16, 1873.

301.—DENNIS, W., Holborn, "Improvements in apparatus for forcing and discharging water, air, and other fluids and gases, for extinguishing fires, and for other useful purposes." Jan. 25, 1873.

314.—GIRDWOOD, R., Edinburgh, "An improved portable apparatus for illuminating by means of gas." Jan. 27, 1873.

347.—YOUNG, G., Grangemouth, N.B., "Improvements in lamp lanterns and in the lenses used therein, the same being also applicable to lighthouses." Jan. 29, 1873.

389.—PLATT, G., Birmingham, "A new improved mode of imparting ornamental effect to chandeliers, branches, and other ornamental gas-fittings." Feb. 1, 1873.

442.—DEAN, W., Bradford, and LANCASTER, R., Shelf, near Halifax, "Improvements in gas-regulators." Feb. 6, 1873.

448.—ROBERTSON, J., Glasgow, "Improvements in motive-power and blowing engines, parts of which are applicable to meters for measuring liquids." Feb. 7, 1873.

450.—MAQUAY, S. W., Dublin, "Improvements in the construction of furnace-retorts, to be employed in connexion with other apparatus for the manufacture of gas." Feb. 7, 1873.

561.—ATTWATER, H. C., Horsham, Sussex, "An improved supply and stop valve." Feb. 15, 1873.

569.—PATISON, J., Airdrie, N.B., "Improvements in the destructive distillation of coal and shale for the production of illuminating gas, fuel, and oil, and other products therefrom, and in the apparatus therefor." Feb. 15, 1873.

570.—SCOTT, H. Y. D., Ealing, "Improvements in the deodorization of excreta, and in the manufacture of manures therefrom." Feb. 15, 1873.

713.—BARLOW, J. R., and WALSH, R., both of Bolton, "Improvements in apparatus for distributing water." Feb. 26, 1873.

656.—CAMPBELL, M., Maryborough, Ireland, "Improvements in arrangements and apparatus for preparing peat, small coals, coal tar, petroleum, or other similar substances for fuel." Feb. 21, 1873.

896.—DARWIN, S. B., Shrewsbury, "Improvements in the means of manufacturing gas." March 12, 1873.

1255.—WEST, J., Maidstone, "An improved method of manufacturing gas, and for the apparatus employed therewith." April 4, 1873.

1263.—PASHLEY, G., Sheffield, "Improvements in valves." April 4, 1873.

1799.—CAFFALL, R. M., Alton, Hants, "Improved means of and appliances for automatically preventing the back rush of gas from gasometers, for purifying the gas, and for improving the brilliancy of the lights or flames of gas." May 17, 1873.

1894.—SPENCER, W. H., New York, "Improvements in the process of and apparatus for manufacturing illuminating gas." May 26, 1873.

1915.—HOOD, W. C., Battersea, Surrey, "An improved meter for water and other liquids." May 28, 1873.

PATENTS WHICH HAVE BECOME VOID

BY REASON OF THE NON-PAYMENT OF THE ADDITIONAL STAMP DUTY OF £50 BEFORE THE EXPIRATION OF THE THIRD YEAR.

1634.—POCOCK, A. W., "Improvements in meters, pumps, or other engines for water or other liquid." June 6, 1870.

1640.—WILSON, W., "Improvements in and apparatus for manufacturing gas for illuminating and heating from coal oils." June 7, 1870.

1733.—JOSEPH, C., "Improvements in gas-burners." June 17, 1870.

1906.—YOUNG, J., "Improvements in lamps." July 6, 1870.

1952.—MARRIOTT, W., "Improvements in the manufacture of iron salts or compounds, and in the purification of gas." July 9, 1870.

1988.—NEWTON, W. E., "Improvements in indicators for gas or water meters, &c." July 14, 1870.

2061.—NEWTON, W. E., "Improvements in lamps." July 21, 1870.

2071.—HIGGS, T., and ELLIOTT, J., "Improvements in gas-regulators." July 22, 1870.

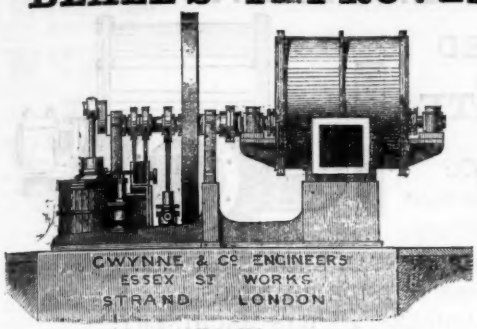
2083.—NEWTON, W. E., "Improvements in apparatus for the manufacture of gas." July 23, 1870.

PATENT WHICH HAS BECOME VOID

BY REASON OF THE NON-PAYMENT OF THE ADDITIONAL STAMP DUTY OF £100 BEFORE THE EXPIRATION OF THE SEVENTH YEAR.

1628.—STEVENS, B. F., "A new or improved method of treating permanent inflammable gases, whereby greater heat is obtained therefrom." June 15, 1866.

BEALE'S IMPROVED PATENT GAS-EXHAUSTERS,



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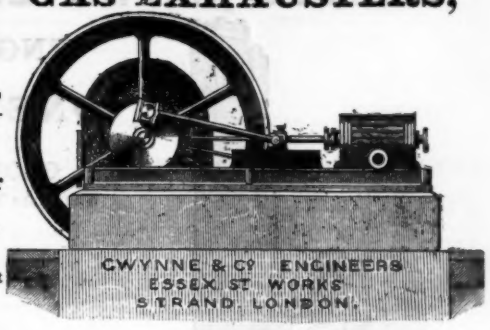

FIG. 224. FIG. 225.

Fig. 224 represents one of those erected at the Imperial Gas-Works, Bromley, capable of passing 210,000 cubic feet of gas per hour. These Patent Machines combine the highest quality of workmanship and materials, the largest bearings and wearing surfaces, with the **most perfect system of action yet discovered.** Fig. 225 represents one of a series of four at the Nottingham Gas-Works, each passing 52,500 cubic feet per hour. GWYNNE AND Co. do not pretend to enter into a struggle with other makers in respect to **cheapness.** They have never sought to make **price the chief consideration,** but to produce Machinery of the very highest quality, and the most approved design and arrangement. Their prices have been estimated with a due regard to the **excellence of the article produced,** and when this is taken into consideration, they have no fear for the result.

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Is now generally admitted by all Gas Engineers.
PRICE AND ANALYSIS MAY BE HAD ON APPLICATION TO
JAMES M'KELVIE, HAYMARKET, EDINBURGH.

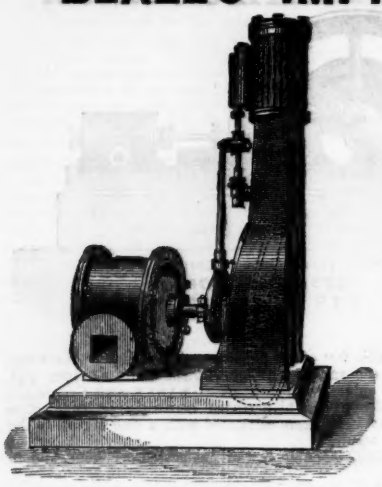
HODGE & CO.'S
IMPROVED VENTILATING SUN-LIGHTS
WITH TALC REFLECTORS AND SELF-ACTING VALVES
TO PREVENT DOWN-DRAUGHT;
VENTILATING GLOBE LIGHTS for DINING-ROOMS, LIBRARIES, &c.
Ormolu, Bronze, & Crystal Gaseliers;
MEDIÆVAL CHURCH WORK AND CORONÆ;
COCKS, VALVES, and FITTINGS for GAS, STEAM, and WATER;
COLUMNS, BRACKETS, & STREET LANTERNS;
BLACK AND GALVANIZED BARREL COMPO AND TIN PIPE.
GAS ENGINEERS,
100, HATTON GARDEN, LONDON.
Drawings and Prices upon application.

Established

1795.

JOSEPH CLIFF & SON,
THE ORIGINAL
WORTLEY FIRE-BRICK WORKS,
NEAR LEEDS,
MANUFACTURERS OF ALL DESCRIPTIONS OF
FIRE GOODS, and Salt-Glazed Drain-Pipes.
LONDON WHARF:
Wharf No. 4, inside Great Northern Goods Station, King's Cross, N.;
LIVERPOOL—1, Back Leeds Street,
Where is always kept a Stock of Retorts, Fire-Bricks, Terra Cotta Ware, and Drain-Pipes.

BEALE'S IMPROVED PATENT GAS-EXHAUSTER

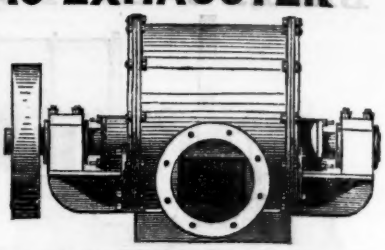


WITH

ENGINE COMBINED

ON

ONE BASE PLATE.



SOLE MAKERS,

GEORGE WALLER & CO.,

Who, since Mr. BEALE'S retirement, are the Oldest Makers.

EXHAUSTERS with HORIZONTAL ENGINE combined.
EXHAUSTERS with OUTSIDE BEARINGS.
MAKERS of ENGINES, BOILERS, and GAS MACHINERY.
TAR, LIQUOR, and SYPHON PUMPS. GAS-VALVES in stock, 2 to 30 inches.
SELF-ACTING BYE-PASS VALVES, with Lid and Relieving Lever.
MANN'S and many other descriptions of WATER DISTRIBUTORS,
SCRUBBERS, PURIFIERS, and CONDENSERS.
EXHAUSTERS from 3000 to 60,000, new and second hand, in stock.

PHŒNIX ENGINEERING WORKS, HOLLAND STREET, S.E., & at STROUD, GLOUCESTERSHIRE.

THE STEAM STOKER COMPANY, LIMITED,

ARE NOW PREPARED TO GRANT

LICENCES FOR THE USE OF THEIR VARIOUS PATENTS

FOR

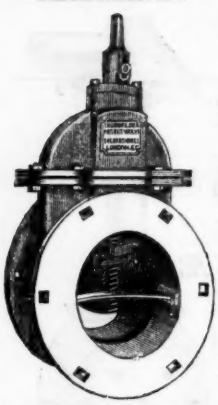
STOKING BY MACHINERY.

UNDER one or the other of their Patents, Machines can be adapted to almost any existing works without material alteration of the Retort-Houses or Settings.

Applications, accompanied by full particulars as to dimensions of the Retort-Houses, Settings of the Retorts, &c., &c., should be addressed to the Secretary, at the Offices of the Company,

155, FENCHURCH STREET, LONDON, E.C.

THORNELOE'S



PATENT VALVE.

THORNELOE & COCHRAN,

GAS ENGINEERS AND CONTRACTORS,

SOLE MAKERS OF

CHANDLER AND SON'S

PATENT REGULATING DIP-PIPE.

Copy Testimonial.—A series of experiments have taken place at the Erith Gas-Works with "Chandler's Patent Dip-Pipe," which was found to prevent any deposit of carbon taking place at the back or on the surface of the clay retorts; there was also considerable increase of gas per ton of coal carbonized, whilst the apparatus continues working with the greatest simplicity and certainty.

Prospectus, with Price Lists and Particulars, on Application.

THORNELOE'S PATENT VALVE

For GAS and WATER, from 3 to 24 inches,

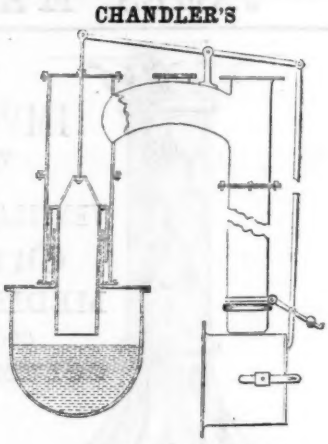
SUPPLIED FROM STOCK.

They are now in use at the following Gas-Works in London:—PHŒNIX and SOUTH METROPOLITAN; also at Aylesbury, Aldershot, Colchester, Farnham, Guildford, Leicester, Ilford, Middlesboro' Patent Gas Company, Reading, &c.

ADDRESS—

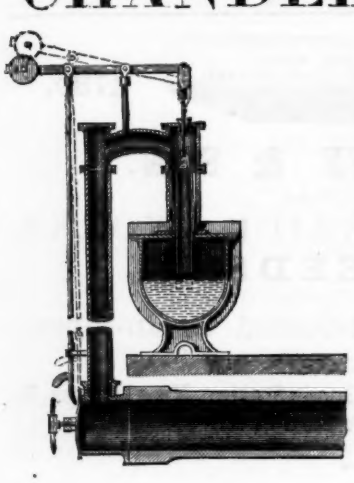
34, LONDON WALL, LONDON, E.C.

CHANDLER'S



PATENT DIP-PIPE.

CHANDLER'S PATENT DIP-PIPE.



It is well known by all Gas Managers that back pressure upon the retorts greatly retards the production of gas, causing a deposit of carbon which keeps steadily accumulating. Such carbon reduces the capacity of the retorts, requires extra fuel for heating, and has to be frequently removed by heavy iron bars, which very much injure the retorts. By the use of Chandler's Patent Dip all these evils are entirely remedied. When the retorts are being drawn and charged, the Dip-Pipe is sealed in the fluid of the hydraulic main. As soon as the lids are replaced, the Dip is raised completely out of the fluid, and the gas passes unrestricted to the holders. By running the exhauster to a level gauge, ALL PRESSURE IS REMOVED FROM THE RETORTS. The consequence is that there is no deposit of carbon, no need of scurfing, no extra fuel is required, a large saving of wear and tear and loss of time is effected, and a greatly increased production of gas per ton of coal is realized.

The following testimonial letter has been received from the manager of the Erith Gas-Works:

Messrs. Chandler and Sons.—Gentlemen,—I beg to inform you that during last week I carbonized 18 tons 5 cwt. of Ravensworth Pelaw Coal in a single setting of retorts fitted with your Patent Dip-Pipes, and obtained a yield of 195,800 feet of gas, equal to 10,730 feet per ton, which is a considerably greater yield than I have been able to obtain before using your Dip. The single retort fitted with your Patent Dip, which has now been in use here upwards of four months, has been throughout, and is now, quite free from carbon.—I am, gentlemen, &c.,
Erith Gas-Works, Aug. 2, 1873. (Signed) D. VINCENT, Manager.

For terms of use and cost, apply only to the Patentees,

Messrs. CHANDLER & SONS, YORK STREET, LONDON ROAD, SOUTHWARK, LONDON, S.E.

WANTED, a Manager for small Gas-Works at Wendover, near Tring.
For particulars, apply to the MANAGING DIRECTOR, High Street, WENDOVER.

WANTED, an Exhauster and a Scrubber (second-hand), each to pass about 10 cubic feet per hour.
Quote lowest cash price to Kidsgrove Gaslight Company, STAFFORDSHIRE.

WANTED, by the Advertiser, aged 28 (at present with a large Gas Company, and having ten years experience), a situation as MANAGER. Unexceptionable testimonials and references. Uses the photometer. No objection to go abroad.
Address PHOTO, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

TO STOKERS AND OTHERS.

WANTED immediately, a Man to Assist in the general out-door work on a small Gas-Work, and in the retort-house for three or four months in winter. Constant employ.
Apply, with testimonials from last employer, stating wages required, to G. SMEDLEY, Gas-Works, BUXTON.
Buxton, Aug. 8, 1873.

WANTED, an appointment as Engineer and MANAGER of Gas-Works, or to erect and manage works abroad. Has had long practical experience in every department, seven years of which have been on the Continent.
Address R. X., care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

TO GAS MANAGERS AND OTHERS.

WANTED, a Re-engagement by an experienced Gas-fitter. Understands repairing wet meters, quarterly inspection, laying services, and smith's work. Willing to make himself generally useful in a Gas-Work. Could undertake the management of small works. Good references.
Address C. O., 155, CHEAPSIDE, E.C.

WANTED, for the Tonbridge Gas-Works, a steady man as GAS-FITTER, Main and Service Layer. One able to do the ordinary smith's work preferred.
Also a good STOKER. He must be used to the working of an exhauster.
Address, with references, stating age and if married, to C. W. KITTO, Manager.
Aug. 7, 1873.

WANTED, a situation as Clerk and COLLECTOR. Has been employed in a Gas-Work upwards of eleven years; seven years as Senior Clerk and Collector, and Sub-Manager. Nearly 2000 accounts. Uses photometer. No objection to go abroad. Salary from £120 upwards.
Apply to G. W., 115, Villa Street, Westmoreland Road, WALWORTH COMMON, S.E.

WANTED, a Secretary, who must also attend to the Commercial Business of the Company. His whole time will be required, and security must be given.
Particulars as to salary and the duties to be performed may be obtained of the Managing Directors, or of Mr. JOHN HENRY HALE, the present Secretary.
Wellingborough Gaslight Company, Limited,
Office, 7, Market Square.

WANTED, by the Hornsey (Middlesex) Gas Company, a person well qualified to take charge of the Company's works as MANAGER. He must be thoroughly conversant with the working of clay retorts, and a good carbonizer, and will be required to devote his entire time to the Company. Salary £120 per annum, with an excellent residence, coal and gas included.
Apply to the undersigned, at the Company's principal Office, 37, Cursitor Street, Chancery Lane, LONDON, E.C.
By order, ROBERT WATSON, Secretary.
Aug. 6, 1873.

COOKING AND HEATING BY GAS,
BY
MAGNUS OHREN, A.I.C.E.

NEW AND REVISED EDITION.

Prepared for Gas Companies to circulate amongst their gas consumers.
£1 per 100; £3 15s. per 500; or £6 per 1000.
Address, MAGNUS OHREN, Gas-Works Lower Sydenham, London, S.E.

COST PRICE SHEETS.

MANUFACTURE AND DISTRIBUTION OF GAS. These sheets are the same as were laid before the Dublin Meeting of the British Association of Gas Managers; but in the REPRINT, NOTES have been added for the guidance of those using them. Copies of the two sheets may now be had, price 5s.
South Shields, January, 1873. W. J. WARNER.

ASSISTANT Gas-Rental Clerk Wanted, by a metropolitan Gas Company. Salary £100 per annum.
State age, experience, and references, by letter, to Y. X., care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

A SITUATION is required by a young man (aged 24) as COLLECTOR or INSPECTOR in a country Gas-Work. Willing to assist in any way, either in the office or works. First-rate testimonials from a metropolitan Gas Company.
Address A. G., 71, Hill Street, Peckham, LONDON, S.E.

TRAVELLER AND COMMISSION AGENCY.

THE Advertiser, working the Midland, Eastern, and Southern Counties, desires to REPRESENT good manufacturing firms of Dry Meters, Brass Work, Chandeliers, Tools, Machinery Oil, and other details used principally by Plumbers and Companies.
Letters in confidence to A. B. C., care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

TO BE SOLD, about a mile of 4-inch GAS-PIPES, in capital condition. Price 7s. 9d. per cwt., put on rails.
Apply to ROBERT DEMPSTER, Gas Engineer, Rose Mount Iron-Works, Elland, near HALIFAX.

FOR SALE—One 40 ft. by 16 ft. Gasholder, at present in use, with 7-in. inlet and outlet pipes and hydraulic valves complete.
Can be seen working at the Radcliffe and Pilkington Gas-Works, near Manchester, or any information can be obtained respecting the same by application to D. BRANDWOOD, the Company's Manager and Secretary.
July 7, 1873.

FOR SALE, a Set of Four Second-hand PURIFIERS, 5 ft. square, 2 ft. 6 in. deep, inlet and outlet 6 in., with 5-in. connexions; four tiers wood sieves or grids to each, hydraulic centre-valve, lifting apparatus and girders, heavy castings, and fastened with ⅜-in. angle iron. Removed to place Purifiers of larger dimensions.
For price and particulars, apply to THOS. H. BOUTTELL, Manager and Analyst, Gas-Works, SLEAFORD.

TO BE DISPOSED OF, in consequence of being replaced by larger ones, a pair of 6 H.P. VERTICAL ENGINES, with oscilating cylinders, and a pair of 20,000 feet per hour Rotary Exhausters, with all valves and connexions.
Also 28 15-in. D Mouthpieces and Ascension-Pipes to suit.
The above are in good condition, and will be sold together or separately.
Apply to W. C. WATSON, Engineer, Gas-Works, KINGSTON-ON-THAMES.

THE NEW GAS COMPANY, LIMITED.

THE Directors of the above Company are ready to receive APPLICATIONS from owners of existing Gas-Works, as well as from others erecting or about to erect new works, and to grant Licences for the use of the Patents.
Apply to the SECRETARY, 22, WALBROOK, E.C.

TAR AND SULPHATE OF AMMONIA.

THE Directors of the Cambridge University and Town Gaslight Company are prepared to receive TENDERS for the purchase of their TAR and SULPHATE OF AMMONIA.
Further particulars may be had of the Manager, Gas-Works, Cambridge. W. WOOD, Manager.
Cambridge, Aug. 7, 1873.

TO BRICKMAKERS AND OTHERS.

THE Directors of The Gaslight and Coke Company are prepared to receive TENDERS for the purchase of the BREEZE manufactured at their Beckton, Kensal Green, Silvertown, and Bow Common Stations, in accordance with a specification to be obtained at this Office.—By order,
JOHN ORWELL PHILLIPS, Secretary.
Chief Office, Horseferry Road,
Westminster, S.W., Aug. 7, 1873.

TO COAL PROPRIETORS.

THE Mold Gas and Water Company are prepared to receive OFFERS for the supply of good clean GAS COAL, for One year, ending Sept. 30, 1874. Probable quantity about 800 tons, to be delivered at Mold Railway Station at such times and in such quantities as the Directors deem necessary.
The Directors do not bind themselves to accept the lowest or any offer.
GEORGE LOWE, Manager, Gas-Works, MOLD.

TO GAS-METER MANUFACTURERS.

THE Directors of the Warrington Gas Company are prepared to receive TENDERS for a New STATION-METER, to be erected on their works in Mersey Street, capable of passing 45,000 cubic feet per hour, with the necessary valves, bye-pass, gauges, and tell-tale complete.
Further particulars may be obtained from the undersigned, if necessary, and sealed tenders to be sent in not later than Thursday, the 21st of August.
JAMES PATERSON, Engineer.
Gas Company's Offices, Warrington, July 30, 1873.

NICTHEROY (BRAZIL) GAS COMPANY, LIMITED.

THE Directors of this Company wish to engage a MANAGER of their Works at Nictheroy (Rio de Janeiro). Applicants must have considerable experience in gas management, and be capable of taking entire charge of and extending the works. Salary £700 per annum, with a proportion of profits.
Written applications, with references, to be addressed to the Secretary.—By Order,
WALTER WRIGHT, Secretary.
5, Great Winchester Street Buildings,
London, Aug. 6, 1873.

BIRSTAL LOCAL BOARD.

GASHOLDER FOR SALE.

THE Local Board are prepared to receive and do invite TENDERS for the purchase of a GAS-HOLDER, 33 ft. in diameter and 12 ft. deep, at present in use at their works at Smithies, Birstal, near Leeds (adjoining to the London and North-Western Railway Station).
The holder, which is in good repair, can be seen working at the Gas-Works, and any further information may be obtained respecting it on application to Mr. George Severs, the Gas-Works Manager.
Sealed tenders must be delivered at my Offices, endorsed "Tender for Gasholder," not later than Thursday, the 21st inst. The Local Board do not pledge themselves to accept any tender.
The holder can be taken away immediately, but will have to be paid for before it leaves the premises.—By order,
JOHN SMITH, Solicitor, Clerk to the Board.
Birstal, near Leeds, Aug. 8, 1873.

PETERBOROUGH GAS-WORKS.

CONTRACT No. 1.

THE Directors of the Peterborough Gas Company are prepared to receive TENDERS for the erection of a RETORT-HOUSE and other Buildings, and for the construction of other works.
Drawings and specifications may be seen, and forms of tender with bills of quantities may be obtained, on payment of one guinea each, on application to Mr. W. J. Moon, the Manager, at the Gas-Works, Peterborough, and at the offices of Mr. G. W. Stevenson, Engineer, 19, Great George Street, Westminster, on and after Tuesday, the 19th day of August inst.
Tenders must be delivered to the Manager, at the Gas-Works, Peterborough, on or before Monday, the 8th day of September, 1873. By order,
JOHN GRAVES, Secretary to the Company.
Peterborough, Aug. 9, 1873.

IMPERIAL GASLIGHT AND COKE COMPANY.
NOTICE is hereby given, that the ordinary HALF-YEARLY GENERAL MEETING of the PROPRIETORS of this Company will be held at 33, John Street, Bedford Row, London, on THURSDAY, the 21st inst., at One o'clock precisely, to receive the Report of the Directors and the Accounts of the Company, and to declare a Dividend for the half year ending the 30th of June last.
By order, HARRY CHUBB, Secretary.
Offices of the Company, 33 and 34, John Street,
Bedford Row, London, Aug. 1, 1873.

BROMLEY GAS CONSUMERS COMPANY.
NOTICE is hereby given, that an EXTRAORDINARY GENERAL MEETING of this Company will be held at the Bell Hotel, Bromley, Kent, on TUESDAY, the 26th day of August inst., at half-past Five o'clock precisely, to declare an interim dividend for the half year ending the 30th of June last. By order,
GEORGE H. OSBORN, Secretary and Manager.
Offices and Works, Brick-kiln Lane, Bromley,
Kent, Aug. 8, 1873.

RATCLIFF GASLIGHT AND COKE COMPANY.
OFFICES, 345, CABLE STREET, LONDON, E.,
Aug. 12, 1873.
NOTICE is hereby given, that a HALF-YEARLY GENERAL MEETING of the SHAREHOLDERS of this Company will be held at the Company's Offices, as above, on FRIDAY, the 29th day of August inst., at Two o'clock in the afternoon precisely, to declare a Dividend for the half year ended June 30, 1873, and for other general purposes of business.
And NOTICE is hereby further given, that the register of transfers will be closed from the 25th of August inst. to the 29th of August inst., both days inclusive.
By order of the Board,
H. J. BADDELEY, Secretary.

BOLTON CORPORATION—GAS DEPARTMENT.

TENDERS FOR GAS-METERS.

THE Gas Committee are prepared to receive TENDERS for the supply of the NEW WET GAS-METERS, in cast-iron cases, during the ensuing twelve months. The number required may be about 2000, of various sizes.
Sealed tenders, endorsed "Gas-Meters," to be sent to the undersigned on or before Tuesday, the 19th inst.
By order, R. G. HINNELL, Town-Clerk.
Aug. 4, 1873.

PHOTOGRAPHS of the "British and North British Associations of Gas Managers," taken at Tarbet, Lochlomond, on Thursday, June 12, 1873, may be had from JOHN STUART, 120, Buchanan Street, Glasgow. Price, per post (on roller), 3s. each.

THE GAS-FITTER'S GUIDE, containing the Practice and Principles of Lighting Shops and Public Buildings, and Gas-Works. Various Tables of Useful Information, with Plate of Drawings. Second edition. 24 stamps, post free.
J. ELDRIDGE, 54, Murray Street, HOXTON, N.

Will shortly be ready,
AN ANALYSIS OF THE
METROPOLITAN GAS COMPANIES ACCOUNTS for 1872.
Compiled and arranged by JOHN FIELD,
Chief Accountant to the Imperial Gas Company.

In the press, and will shortly be published,
THE GAS CONSUMER'S MANUAL;
OR,
How to obtain Good Light and Cheap Gas.

Being a Popular Exposition of the Chemistry of Gas Lighting, with Practical Instructions in the best methods of burning Gas for Lighting, Cooking, and Heating; and Suggestions as to the proper Sizes of Interior Pipes, Arrangement of Lights, &c., &c.
ILLUSTRATED.

ALSO,
ON SETTING AND WORKING RETORTS.
A Revised and Illustrated Reprint of a Paper read at the Annual Meeting of the British Association of Gas Managers in 1870.
By E. S. CATHELS, Assoc. Inst. C.E., Montreal, Canada.

SUPERIOR FIRE-BRICKS.

THE "TAMAR" FIRE-BRICK AND CLAY COMPANY, Limited, offer to supply FIRE GOODS of superior quality on very reasonable terms.
The "Tamar" Fire-Bricks are unusually free from iron, and are considered to be fully equal to Stourbridge and Newcastle.
For particulars, apply to the SECRETARY, 5, Great Winchester Street Buildings, London, E.C.
July 29, 1873.

TORBANEHILL MINERAL.

For Sale, by Tender,
FOR WHOLE OR PART,
SEVERAL THOUSAND TONS OF THE
Celebrated Torbanehill Mineral,
Saved from the fire at Torbanehill in June last.

The mineral as it at present lies has been examined and analyzed by Dr. WILLIAM WALLACE, Analytical Chemist, Glasgow, who says:
"Very great care was employed to obtain reliable average samples, and the results show that the mineral is not appreciably damaged."
The results of two testings of fair samples of the Coal give 14,680 cubic feet of 43·7 candle gas.

APPLY TO
MR. DAVID STEWART,
128, INGRAM STREET, GLASGOW.

Mr. ALFRED LASS,
60, CORNHILL, LONDON, E.C.,
Is prepared to open the Books, and, if necessary, keep the Accounts of Gas and Water Companies.
To examine the Books and Accounts, and prepare Balance-Sheets for the information of Directors.
To assist Secretaries in preparing Balance-Sheets, according to the "Gas-Works Clauses Act, 1871;" or may be consulted with respect to Accounts generally.

SAMUEL PONTIFEX, Consulting Gas Engineer, having retired from the Great Central Gas Company, is now prepared to furnish PLANS and SPECIFICATIONS, as well as ADVISE Provincial Gas Companies as to the erection of new, or alteration and enlargement of existing works.
Offices: 22, Coleman Street, LONDON, E.C.

REMOVAL.
MR. ALFRED PENNY, C.E., begs to give notice that he has REMOVED his Offices from the Wenlock Iron-Works to No. 20, ABINGDON STREET, WESTMINSTER, where he may be consulted as usual on all matters connected with Gas-Works, Water-Works, and Drainage, both for England and Abroad.

MR. WILLIAM DORE (19 years Gas Engineer and Accountant) may be CONSULTED upon all matters relating to the manufacture and distribution of gas, and the management, accounts, or transfer of gas undertakings.
Office, 4, Picton Place, Neath, SOUTH WALES.

BIRTLEY IRON WORKS,
CHESTER-LE-STREET,
DURHAM.
Manufactory for every description of Casting and Machinery for Gas-Works and Water-Works.
Warehouse in London for Cast-Iron Pipes and Connexions of all sizes and in any quantity, Scott's Wharf, Bankside, Southwark.
Agent in London, Mr. J. MANWARING, 101 Cannon Street E.C.

E. GODDARD,
GAS-WORKS, IPSWICH,
SOLE AGENT FOR
EDGE'S PATENT
FOR REMOVING THE
CARBONACEOUS INCRUSTATION FROM GAS-RETORTS.

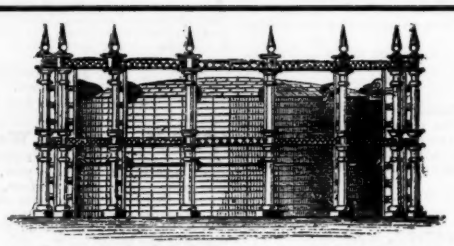
FIRE-CLAY RETORTS.
WILLIAM FRASER,
INVERKEITHING,
(Owner of the Works at which Fire-Clay Retorts were first made), can supply
RETORTS, FIRE-BRICKS, &c.,
to any extent.
References can be given to managers of above a hundred Gas-Works whom he supplies.
He ships at Charlestown his
CELEBRATED HALBEATH STEAM COALS,
on Navy List.

WILLIAM BRODIE & CO.,
GAS ENGINEERS,
MANUFACTURERS AND CONTRACTORS FOR
GAS APPARATUS, GASHOLDERS, TANKS, VALVES, IRON ROOFS, GIRDERS, BRIDGES, &c.,
CALEDONIA IRON-WORKS, PAISLEY.

Attention is requested to
BRODIE'S IMPROVED GAS APPARATUS,
Admitted to be the best and most economical for lighting factories, railway stations, mansions, country houses, and other isolated buildings.

THE THAMES BANK IRON COMPANY,
(Successors to LYNCH WHITE,)
SUPPLY FROM STOCK
CAST-IRON RETORTS, SOCKET-PIPES for GAS or WATER PURPOSES, FLANGE-PIPES for STEAM, RAIN-WATER PIPES and GUTTERS, HOT-WATER PIPES and BOILERS, and all requisite Connexions for same; also LAMP-COLUMNS, LAMPS, WROUGHT FRAMES, WROUGHT-IRON TUBING, &c., &c.
All kinds of Gas-Works Apparatus and General Castings made to Pattern or Drawing.
ADDRESS—
OLD BARGE WHARF, UPPER GROUND STREET, LONDON, S.E.

TO GAS COMPANIES, ENGINEERS, CONTRACTORS, AND OTHERS.
GEORGE NEWTON,
UNION STREET WEST, OLDHAM,
BRASS FOUNDER AND FINISHER,
MANUFACTURER OF
IMPROVED WET AND DRY CONSUMERS GAS-METERS,
LAMP METERS AND BOXES,
GOVERNORS, GAUGES, INDICATORS, EXHAUST & PRESSURE REGISTERS,
GAS STATION-METERS,
With all the joints planed.
TERMS, &c., ON APPLICATION.

HOPE IRON WORKS,

STOCKTON ON TEES.

ASHMORE & WHILE,
GAS ENGINEERS & CONTRACTORS,
MANUFACTURERS OF GASHOLDERS,
GAS APPARATUS OF EVERY DESCRIPTION,
Including Improved
Retort-Lids, Boilers, Cast and Wrought Iron Tanks, Iron Roofing, Bridges, Girders,
And GENERAL IRONWORK.
N.B.—Estimates for all Gas Plant and Remodelling supplied on application.

GAS PURIFICATION.
JOHN WM. O'NEILL AND CO.,
CONTRACTORS FOR
GAS PURIFICATION BY OXIDE OF IRON,
39, LOMBARD STREET, LONDON, E.C.

SIDNEY LEONI & CO.,
19, GREAT GEORGE STREET, WESTMINSTER, S.W.,
AND
ADAMAS WORKS, ST. PAUL STREET, NEW NORTH ROAD, N.,
MANUFACTURERS OF
GAS AND HOT WATER APPARATUS,
AND OF THE WELL-KNOWN
PATENT ADAMAS GAS-BURNERS.
A LARGE STOCK OF ALL KIND FOR FAMILY USE ALWAYS READY.
They have fitted up Cooking Apparatus in large Establishments, where savings of £300 per annum have been effected.
See "Report of the London Hospital," JOURNAL OF GAS LIGHTING, *Aug.* 13, 1872, *No.* 517.
ESTIMATES ON APPLICATION.

JAMES MILNE & SON,

GAS ENGINEERS,

Gas-Meter, Gas Apparatus, and Gas-Fittings Manufacturers,

EDINBURGH, AND

2, KING EDWARD STREET,

NEWGATE STREET, LONDON.

STATION-METERS, GOVERNORS, CONSUMERS METERS, GAS LUSTRES, CHANDELIERS, BRACKETS, &c.,

And every description of Gas-Fittings and Gas Apparatus.

SCHOLL'S

PATENT PLATINUM

GASLIGHT PERFECTER.

Extract from Report by Dr. Letheby:—

"The results have been very remarkable, for they show an average increase of 63 per cent. on the illuminating power of the gas. I am of opinion, therefore, that the invention is of great practical value."

Extract from Dr. Frankland's Course of Lectures at the Royal School of Mines, February, 1868.

"Scholl's Platinum Perfecter is one of the most important inventions of modern times in connexion with the burning of coal gas."

Price 1s. each for Fishtail Burners.

To be had retail of Gas-Fitters and Ironmongers.

JOHN SCHOLL, Manufactory: 41 & 42, BERWICK STREET;

Retail Depot: 198a, OXFORD STREET, LONDON, W.

Terms on application. N.B.—A specimen sent free on receipt of Twelve stamps.

*** Further testimonials from Drs. Frankland and Crooks, showing the great practical value of this invention, will be shortly published.

CANNEL COAL.

ELLIS LEVER & CO.,

GAS COAL MERCHANTS,

107, PICCADILLY, MANCHESTER.

ALL CLASSES OF

ENGLISH, SCOTCH, & WELSH CANNEL COALS.

SAM. CUTLER & SONS,

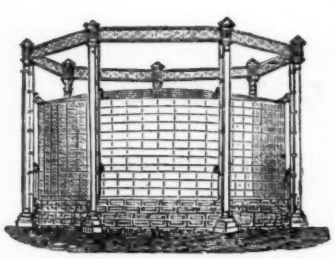
CONTRACTING GAS ENGINEERS,

GASHOLDER & GENERAL GAS APPARATUS MAKERS,

MANUFACTURERS OF

BOILERS, IRON ROOFING, IRON BRIDGES,

AND GENERAL IRONWORK.



S. C. AND SONS undertake Contracts of any magnitude for the **Erection of new and Remodelling of existing Gas-Works**, for **Gasholders, Cast and Wrought Iron Tanks, Iron Roofs**, and every description of **Apparatus** for the Manufacture and Distribution of Gas.

Special attention is invited to their **"Improved Condenser,"** which is very effective, and much approved; also to their patterns of **Annular** and other **Condensers, Scrubbers**, and **Purifiers**, of all sizes, which they arrange either with **Centre** or Ordinary **Slide Valves.**

WORKS FOR THE SUPPLY OF

VILLAGES, MANSIONS, FACTORIES, &c.

S. C. AND SONS undertake the **Supply** and **Laying** of **Mains** for **Gas and Water**, and supply all Castings, Connexions, and Fittings for Retort-House, Works generally, and for Streets. They also supply **Valves** of all descriptions, Iron and Clay Retorts, Hotpressed Retort-Lids, Steel Charging-Scoops of improved make, for which they have special machinery, Improved Coke and Coal Barrows, Cross-Bars and Screws, Bolts and Nuts, Furnace and Stoking Tools, Iron and Wood Purifier-Sieves, Lead, Yarn, Borings, &c., including every requisite whatsoever for a Gas-Work, a well-assorted stock being kept of those goods most in request.

SOLE MAKERS OF BRETT'S PATENT COKE BARROW.

Experienced Retort Setters sent to any part of the Kingdom.

Address: PROVIDENCE IRON-WORKS, MILLWALL, LONDON.

B. CARPENTER'S

IMPROVED WOOD SIEVES

FOR

GAS PURIFIERS & SCRUBBERS.

WORKS:

22, HERMES STREET, PENTONVILLE ROAD,

LONDON, N.

The above Sieves are used by all the Gas Companies in London and a great many in the country. Their utility, durability, and cheapness combined, render them superior to all others.

Testimonials from Gas Engineers who have tested their qualities forwarded on application.

All orders punctually attended to, and estimates given if required.

INTERNATIONAL EXHIBITION, 1862.

CLASS X.

PRIZE MEDAL

For excellence of Fire-Clay Gas Retorts, and

"HONOURABLE MENTION" for good quality of Fire-Bricks.

WILLIAM STEPHENSON & SONS,

THROCKLEY,

NEWCASTLE-ON-TYNE.

BRONNER'S PATENT GAS-BURNERS give 99 per cent. of light, as compared with 27 per cent. given by ordinary burners, with equal consumption of gas.—*Vide* "Gas Referees Report," published June, 1869.

HENRY GREENE AND SON, Sole Consignees of Brönner's Patent Improvements in Gas Lighting, 16 and 17, King William Street, LONDON, E.C.

BELGIAN CLAY RETORTS.

J. SUGG and CO., late ALBERT KELLER, GHENT.—The removal of the import duties on Earthenware permitting the entry of Clay Retorts into England, Messrs. Sugg, of Ghent, beg to draw the attention of the Gas Companies of London, and other Cities, to the very superior quality of the RETORTS manufactured by them. They can be made of any size, in one piece, and of any form. The price will be in proportion to the weight, and very moderate in comparison to their value.

Communications addressed to J. SUGG & CO., GHENT, will receive immediate attention.

CATHELS & TERRACE'S Patent Four-WAY DISC GAS-VALVE is the simplest and best Valve for Purifiers, and as a By-pass for other apparatus in Gas-Works. It is always gas-tight, and has no springs, ground faces, or other delicate parts. By its use the flow of the gas cannot be accidentally stopped, and it never sticks.

For prices, &c., apply to the Manufacturers, Messrs. GUEST AND CHRIMES, Foundry and Brass Works, ROTHERHAM.

CATHELS'S Patent District Dry Gas-GOVERNOR is the only perfect self-acting contrivance for Regulating the Pressures in the higher levels of a district.

For prices, &c., apply to the Manufacturers, Messrs. GUEST AND CHRIMES, ROTHERHAM.

ADDISON POTTER,

WILLINGTON QUAY,

NEAR NEWCASTLE-UPON-TYNE,

Manufacturer of Clay Retorts, Fire-Bricks and every description of Fire-Clay Goods.

CLAYTON'S PATENT SIX-WAY VALVE only requires one valve to work two purifiers; saves more than three-fourths of the connexion-pipes; requires neither tees, elbows, nor bends; no racks or springs to get out of order.

For particulars, apply to CLAYTON, SON, & Co., Gas Engineers, Hunslet, LEEDS.

TO GAS COMPANIES, ENGINEERS, &c.

WOOD SIEVES.—WOOD SIEVES.

Estimates given and Contracts taken by the Manufacturer

GEORGE MACKANESS,

36, EDWARD STREET, HAMPSTEAD ROAD,

LONDON, N.W.

These Sieves are made with parallel or bevel bar, and guaranteed to be well seasoned yellow deal, and not common spruce so generally used.

N.B.—Specimens sent free on application.

JAMES OAKES & CO.,

ALFRETON IRON-WORKS, DERBYSHIRE,

AND

WENLOCK IRON WHARF, 20 & 22, WHARF ROAD, CITY ROAD, LONDON, N.,

Beg to inform Gas and Water Companies and the public, that they keep in stock in London all the CASTINGS in general use in Gas and Water Works, including Iron Retorts, Socket and Flange Pipes, Bends, Branches, and Syphons of all sizes, Lamp Columns, &c., &c.

N.B.—Orders for Cast-Iron Tanks, Girders, Columns, Cylinders, and all irregular castings, will have immediate attention. CHARLES HORSLEY, Agent.

ALEXANDER F. PAINTER,

CONTRACTING ENGINEER

FOR

GAS & WATER WORKS,

GREAT BERKHAMPSTEAD, HERTS.

Foreign Orders carefully executed. Provincial Gas-Works designed and erected. Extensions of Works carried out with despatch. Mains supplied and promptly laid. Public and Private Buildings fitted up. Gasholders, Purifier Covers, and all Sheet Ironwork. Wrought Ironwork to drawing.

Specifications, Estimates, and Tenders given.

GAS-WORKS LEASED.

THE IMPERIAL METER COMPANY, LIMITED,

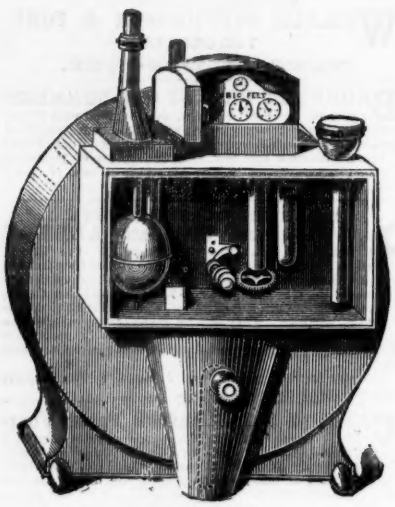
MANUFACTURERS OF

WET AND DRY GAS-METERS,

PRESSURE-GAUGES AND GOVERNORS, AND STREET-LAMP REGULATORS.

FACTORIES:

KING'S ROAD, LONDON, N.W., and GRAY'S INN ROAD, LONDON, W.C.



Front View.

THE

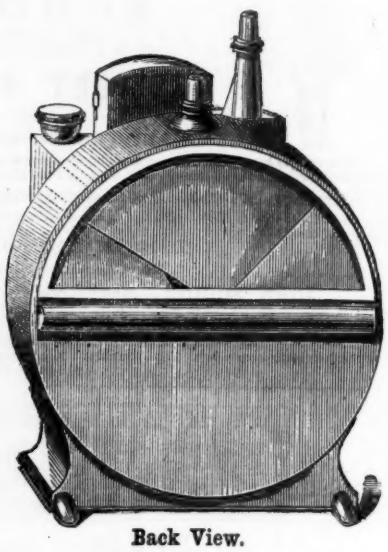
IMPERIAL

COMPENSATING

WET GAS-METER.

DE CASTRO & BURTON'S

PATENT.



Back View.

I. **This Meter is more simple in construction than the common non-compensating Meter.**
II. **An unvarying water-line is maintained.**
III. **No amount or kind of pressure will cause it to "flood."**
IV. **It is practically unaffected by "tilting."**
V. **The friction is less than in any other Meter; and**
VI. **It will last for twelve months without requiring to be refilled.**

THE IMPERIAL METER COMPANY, LIMITED, ALSO MANUFACTURE COMMON NON-COMPENSATING WET GAS-METERS OF ALL SIZES, BOTH IN TIN AND CAST-IRON CASES.

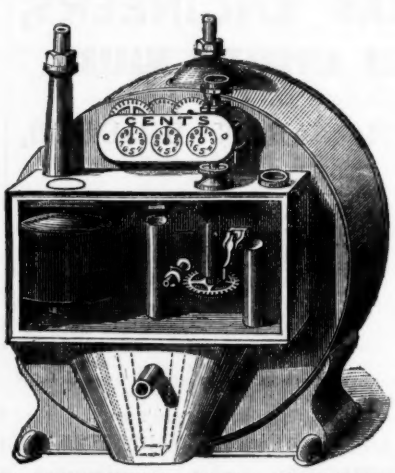
THE COMPENSATING

WET GAS-METER

IS UPHELD FOR

TEN YEARS

WITHOUT CHARGE.



THE IMPERIAL WET GAS-METER.
Non-Compensator.

STATION-METERS

WITH PLANED JOINTS,

AND

GOVERNORS,

MADE TO ORDER.

Mr. GEORGE MACKANESS will represent this Company in the Provinces.

OFFICES: 41, FLEET STREET, LONDON, E.C.

W. MOORE, Secretary.

☞ *All Communications to be addressed to the Secretary.*

THE IMPERIAL METER COMPANY, LIMITED,

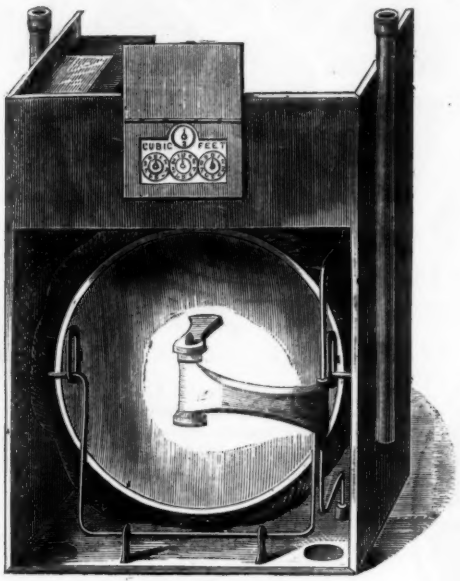
MANUFACTURERS OF

WET AND DRY GAS-METERS,

PRESSURE-GAUGES AND GOVERNORS, AND STREET-LAMP REGULATORS.

FACTORIES:

KING'S ROAD, LONDON, N.W., and GRAY'S INN ROAD, LONDON, W.C.



Front View.

THE

IMPERIAL

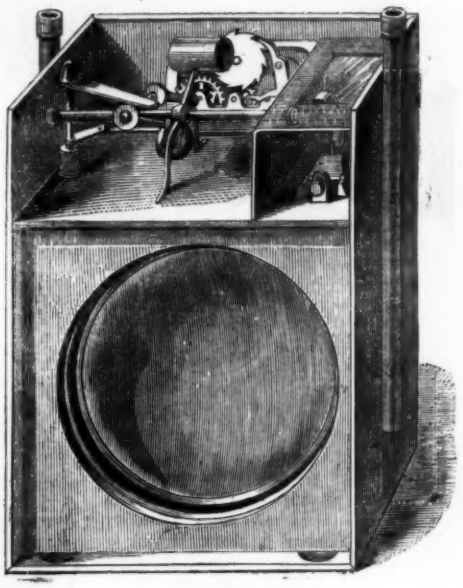
DRY

GAS-METER

SINGLE DIAPHRAGM.

TELLING & JOHNSON'S

PATENT.



Back View.

I. The mechanical construction of this Meter is simpler and stronger than any other.
II. About half as much leather is used as in ordinary dry Meters.
III. The Meter has only one valve, and this cannot "stick."
IV. The lights maintain perfect steadiness and strength of flame. There is no "draw."
V. The gas consumed can only be measured from the inlet to the outlet, and
VI. The index cannot be made to register backwards.

THE IMPERIAL METER COMPANY, LIMITED, ALSO MANUFACTURE ORDINARY DOUBLE DIAPHRAGM DRY GAS-METERS OF ALL SIZES, BOTH IN TIN AND IN CAST-IRON CASES.

SPECIAL ATTENTION

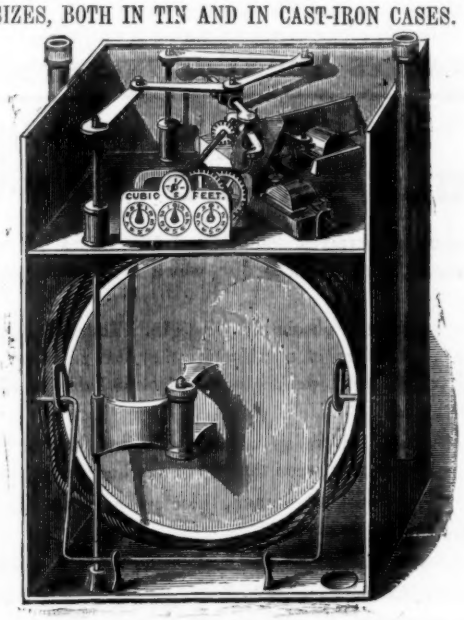
IS PAID TO THE

MANUFACTURE OF

STREET-LAMPS

AND

REGULATORS.



EVERY

DRY GAS-METER

IS UPHELD FOR

SIX YEARS

WITHOUT CHARGE.

THE IMPERIAL DRY GAS-METER.
Double Diaphragm.

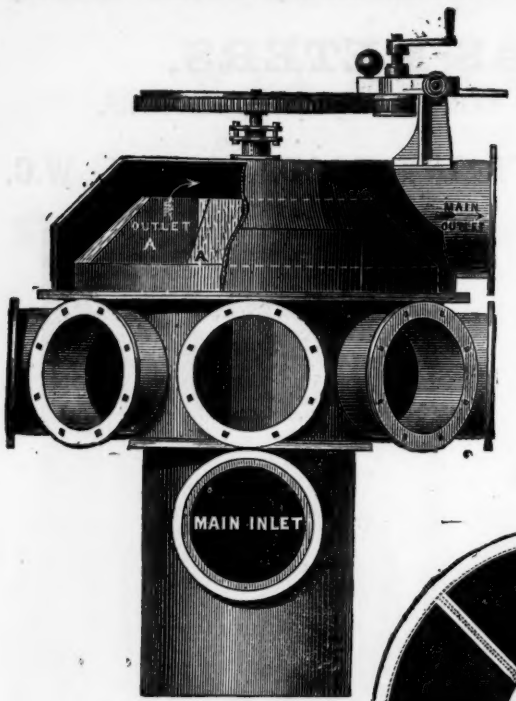
Mr. GEORGE MACKANESS will represent this Company in the Provinces.

OFFICES: 41, FLEET STREET, LONDON, E.C.

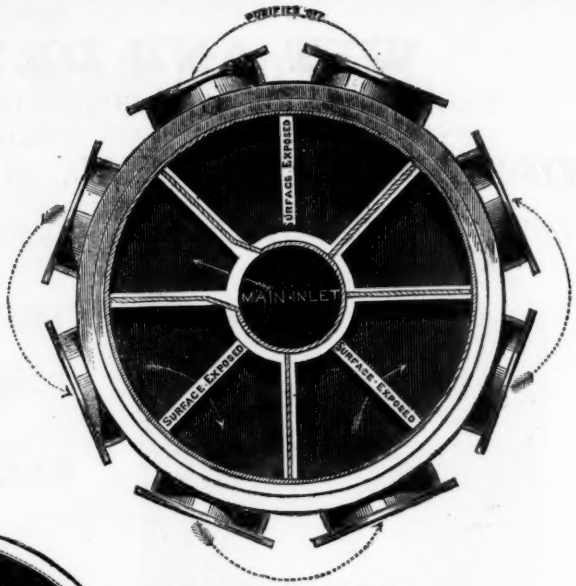
W. MOORE, Secretary.

☞ *All Communications to be addressed to the Secretary.*

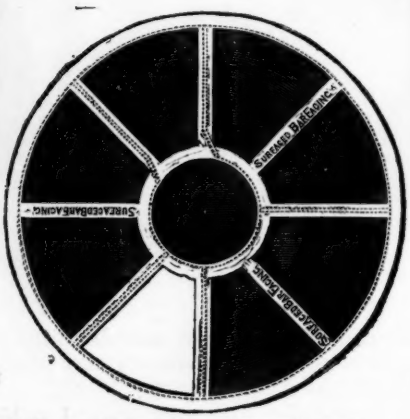
C. & W. WALKERS' PATENT CENTRE-VALVES.



Elevation of the Centre-Valve for four Purifiers. The safety cover is shown broken, to enable the Valve itself, which is inside, to be seen.



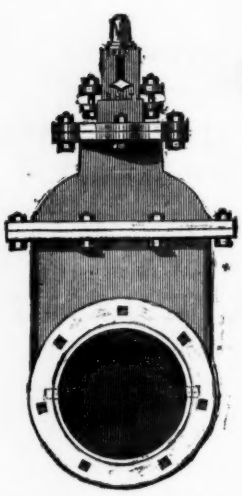
Plan of the Body, showing the Valve lying in it, with three of the facings, which were formerly exposed to settlements of dirt, carbon, naphthaline, &c., but which are now always covered by the surfaced bar-facings of the Valve. (See below.)



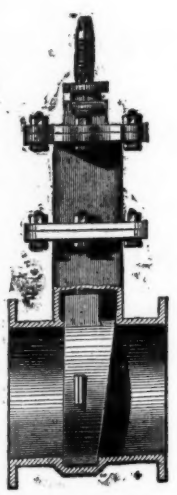
Plan of the Valve, or upper portion, showing the surfaced bar-facings referred to above.

These PATENT CENTRE-VALVES are the most perfect and certain means for working Purifiers. The Valve itself is protected from all injury inside the safety cover. The working of the Valve is so easy, and so governed by the stop-catch movement, that the Purifiers can be instantaneously changed in the dark as well as in daylight. They are scraped perfectly true, metal to metal, the facings heretofore exposed are always covered, and there is nothing more reliable, certain, and durable in a gas-works. By their use the floor of the Purifying-house is clear and level; the Valve and all connexions being beneath the floor, out of the way of working. A very considerable improvement and saving is effected in the cost of the connecting-pipes.

FOUR-WAY CENTRE-VALVES FORMING INLET, OUTLET, AND BYE-PASS.



C. & W. WALKERS'
DOUBLE-FACED GAS-VALVES.



These solidly constructed double-faced Gas-Valves are superseding the old system of the light, single-faced disc, which is too uncertain and unreliable in large bores.

They are guaranteed absolutely gas-tight. They are very massive and rigid, and by improved modes of manufacture they are produced at very little excess in cost over the old light, weak system, which is liable to spring and bend, and become leaky.

The Valve is a rigid wedge of solid cast iron, having two perfectly scraped surfaced facings fitting between the two on the body, which are also surfaced.

A spring in two short halves, and, therefore, not liable to break, is used only for scraping the front facing clean.

The front facing is vertical; the back facing forms the wedge.

At a slight additional expense both flanges are faced to bolt to main-pipes.

GASHOLDERS, TELESCOPE & SINGLE-LIFT, of LARGEST DIMENSIONS.

PURIFIERS, SCRUBBERS, CONDENSERS of most Improved Description.

WOOD SIEVES FOR PURIFIERS,

Which have now been in use for more than ten years, and their advantages and durability fully established. They are made entirely by steam machinery in very large quantities at the most moderate cost.

MIDLAND IRON-WORKS, DONNINGTON, near NEWPORT, SHROPSHIRE; 8, FINSBURY CIRCUS, LONDON.

ESTABLISHED 1844.

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RAILWAY WORKS, LEEDS,

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MAKERS, BY SPECIAL MACHINERY, OF PATENTED MECHANICAL INVENTIONS,

Comprising numerous Labour-saving Appliances and Economizers of Fuel and Motive Power;

CONTRACTORS TO THE EUROPEAN & COLONIAL GOVERNMENTS & CORPORATIONS;

MERCHANTS AND SHIPPERS OF MACHINERY, METALS, AND HARDWARE;

AWARDED

THE FIRST PRIZE MEDAL AT THE EXPOSITION UNIVERSELLE, PARIS, 1867, "For Improved Construction, Excellence of Material, and Superior Workmanship;"

TWO GRAND GOLD MEDALS AT THE MOSCOW INTERNATIONAL EXHIBITION, 1872;

ALSO THE FIRST PRIZE MEDALS AT LEEDS AND LYONS IN 1858, 1868, AND 1872.

"REDUCTION IN PRICES OF PEET'S VALVES, consequent upon largely increased sales."

ILLUSTRATED CATALOGUES AND ESTIMATES ON APPLICATION.

Correspondence conducted in English, German, or French.

Samples of Specialties may be inspected at Stand No. 542, Group XIII., in the English Machinery Annexe of the Vienna Exhibition, 1873. For List of same see German Official and "British Section" Catalogues.

ALFRED WILLIAMS,

PHŒNIX FIRE-BRICK WHARF,

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GAS ENGINEER AND CONTRACTOR FOR THE ERECTION OF GAS-WORKS,

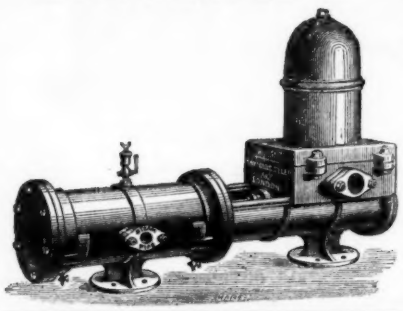
AND FOR THE

SUPPLY OF RETORTS, FIRE-BRICKS, CAST-IRON MAINS,

AND ALL MATERIALS FOR GAS MANUFACTURE AND DISTRIBUTION.

THE PATENT

"UNIVERSAL" STEAM PUMP.



SOLE MAKERS,

HAYWARD, TYLER, & CO.,

84 & 85, UPPER WHITECROSS STREET, LONDON, E.C.

IN USE IN SOME OF

THE PRINCIPAL GAS-WORKS IN LONDON, SHEFFIELD, PENISTONE, &c.,

FOR

TAR AND AMMONIACAL LIQUORS.

Ardwick Bridge Chemical Works, Manchester, Oct. 28, 1872.

Sir,—The "Universal" Steam Pump obtained from you, and which has been employed during the last six months pumping caustic soda at these works, still continues working satisfactorily.—Yours truly,

(Signed) PETER HART, *Manager.*

HENRY SKOINES,

CONTRACTING GAS ENGINEER

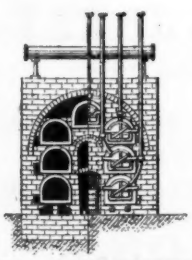
FOR

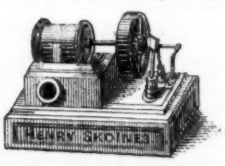
SETTING RETORTS,

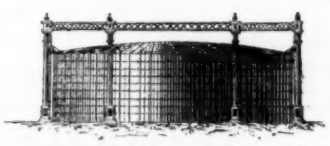
ERECTING AND REMODELLING GAS-WORKS

OF ANY EXTENT, AT HOME AND ABROAD.

RETORTS RESET, and the whole or any portion of Gas Apparatus supplied to the Trade, with their choice of name and device, if desired.







7, ARGYLE STREET, KING'S CROSS.

JOSEPH AIRD,

WELLINGTON TUBE-WORKS,

GREAT BRIDGE, TIPTON,

STAFFORDSHIRE,

MANUFACTURER OF

PATENT WELDED WROUGHT-IRON TUBES AND FITTINGS.

BAILEY'S Patented Inventions are now in extensive use wherever steam is known. Bailey's Patent Steam Gauges, Pyrometers, Water Gauge Cocks, Test Pumps, Fusible Plugs, Steam and Water Valves, Safety Valves, Junction Valves, Pumps, Tell-Tales, Recorders, Lightning Conductors, Electric Telegraphs, Turret Clocks, Steam Joint Cement, Lifting Jacks, Boiler Feeders, Lime Catcher and Separator, Injectors and Ejectors, and every description of first-class Brass Work for Engines and Boilers. Gas-Works Managers who have not our large book should send for it.

16th edition, 1000 engravings, 4to., post free 2s. in stamps, weight 10 oz., cost of production £1000,

BAILEY'S Illustrated Inventions, containing details and prices of goods in our five several departments:—(1) Brass Foundry, Steam Gauges, Indicators, Feeders, and Fittings; (2) Engineers Sundries, Small Tools, and Stores; (3) Machine Pump and Fire Engine; (4) Turret Clock, &c.; (5) Electric Telegraph, A B Instruments, Bells, and Apparatus.

J. BAILEY and Co., Albion Works, Salford, LANCASHIRE.

ROBERT MACLAREN and CO., EGLINTON FOUNDRY, GLASGOW, Manufacturers of all sizes of Cast-Iron Main-Pipes by an improved Patent, General Ironfounders, Gas Engineers, and Wrought-Iron Tube Makers.

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RENOWNED

WOOD SIEVES,

WITH TAPER BARS,

MADE BY MACHINERY

CAPABLE OF MAKING 10,000 PER WEEKLY.

References to Hundreds of First-Class Engineers.

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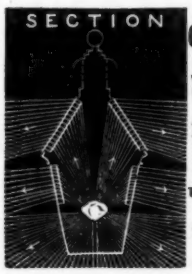
ELLAND, NEAR HALIFAX.

CLOTH GAS-BAGS FOR MAINS,

As supplied to the Imperial, Chartered, and other London and Provincial Gas Companies. Bellows and Valves for inflating Well Dresses, Stokers Gloves, India-Rubber Suction and Delivery Hose, Gas-Tubing, Leather, India-Rubber and Gutta-Percha Machine-Bands, Sheet and Washers for Steam Joints.

T. BUGDEN, Manufacturer,

79, GOSWELL ROAD, LONDON, E.C.



THE PATENT

CATOPTRIC LAMP

for Streets and all Situations where the Light ascending above the level of the Lamp is wasted,

Is now in use in Moorgate St., London, and has been in successful operation upon Waterloo Bridge since Oct. 7, 1871.

T. A. SKELTON, 37, Essex St., Strand, LONDON, INVENTOR AND PATENTEE.

EVERY DESCRIPTION

OF

GAS COAL AND CANNEL

SUPPLIED BY

E. FOSTER & CO.,

COAL and CANNEL

MERCHANTS,

21, JOHN STREET, ADELPHI,

LONDON, W.C.

Prices Quoted on application.

GAS AND WATER PIPES.

WILLIAM MACLEOD & CO.,

METAL MERCHANTS AND CONTRACTORS

18 & 20, ALSTON STREET, GLASGOW.

CAST-IRON GAS AND WATER PIPES AND FURNISHINGS.

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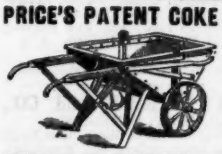

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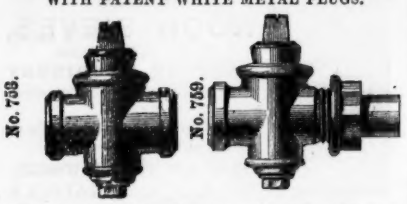

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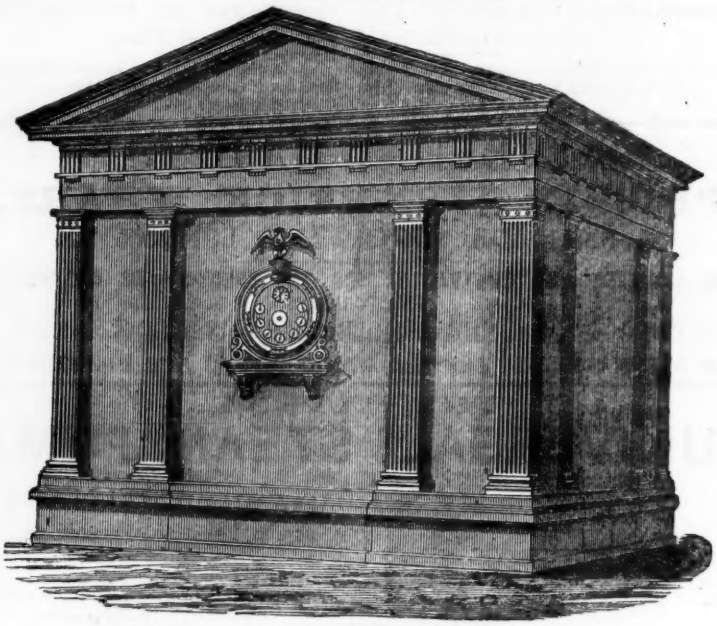

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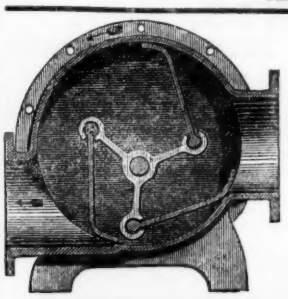

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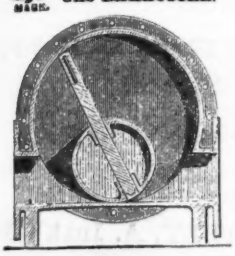

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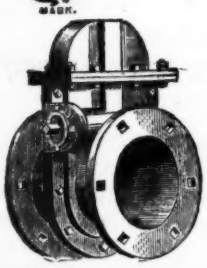

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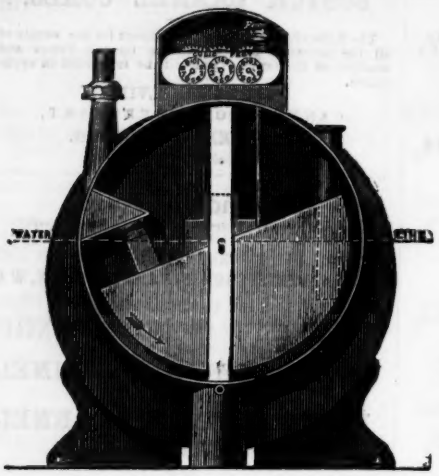

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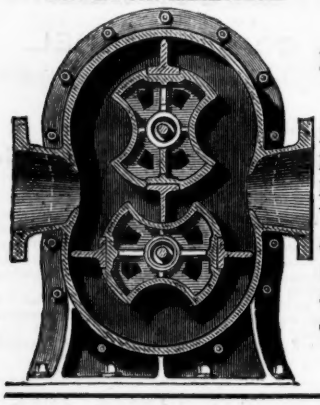

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